

— Deposition of Dr. Norman Trieff, Ph.D.

---

**Deposition of Norman Trieff, PhD. - April 14, 1998**

**PAGE 1 TO PAGE 187**

**NELL McCALLUM & ASSOCIATES**

**713/523-3767**

---

**COMPRESSED TRANSCRIPT AND CONCORDANCE  
PREPARED BY:**

**NELL McCALLUM & ASSOCIATES, INC.  
5300 MEMORIAL DRIVE, SUITE 600  
HOUSTON, TX 77007  
Phone: 713/861-0203  
FAX: 713/523-1541**

## Page 1

(1) No. 96-G-0201  
 (2) HECULES MARINE SERVICES } IN THE DISTRICT COURT OF  
 (3) CORPORATION }  
 (4) v. } BRAZORIA COUNTY, TEXAS  
 (5) BOB CASALE } 239TH JUDICIAL DISTRICT

(6) DEPOSITION OF  
 (7)  
 (8) NORMAN TRIEFF, Ph.D.  
 (9)  
 (10)  
 (11) Between the hours of 10:30 a.m. and 4 p.m.  
 (12) April 14, 1998  
 (13) 1301 McKinney, Suite 3700  
 (14) Houston, Texas  
 (15)  
 (16) Shawn Kelley, Texas CSR No. 5448  
 (17) Nell McCallum & Associates Inc.  
 (18) 5300 Memorial, Suite 600  
 (19) Houston, Texas 77007  
 (20) (713) 523-3767  
 (21)  
 (22)  
 (23)  
 (24)  
 (25)

## Page 2

(1) INDEX - SEE LAST PAGE OF TRANSCRIPT  
 (2) APPEARANCES  
 (3)  
 (4) For the Plaintiff:  
 (5)  
 (6) Sean Jordan  
 (7) Attorney at Law  
 (8) Belme, Maynard & Parsons, L.L.P.  
 (9) 1300 Post Oak Boulevard, 25th Floor  
 (10) Houston, Texas 77056  
 (11)  
 (12) For the Defendant and Intervenor:  
 (13)  
 (14) Michael Fuerst  
 (15) Attorney at Law  
 (16) McDowell Collier, L.L.P.  
 (17) 1301 McKinney, Suite 3700  
 (18) Houston, Texas 77010  
 (19)  
 (20)  
 (21)  
 (22)  
 (23)  
 (24)  
 (25)

## Page 3

(1) NORMAN TRIEFF, Ph.D.,  
 (2) being first duly sworn or affirmed,  
 testified as  
 (3) follows:  
 (4)  
 (5) EXAMINATION BY MR. JORDAN  
 (6)  
 (7) Q. Doctor, would you please state  
 your full name  
 (8) for the record?  
 (9) A. Norman Martin Trieff.  
 (10) Q. Doctor, I'm going to attach as  
 Exhibit No. 1  
 (11) a copy of your curriculum vitae. You  
 probably have  
 (12) that with you right now.  
 (13) A. Yeah.  
 (14) Q. And the one that we'll be attaching  
 is the  
 (15) most recent copy.  
 (16) A. Yes.  
 (17) Q. And it has your address and  
 everything on  
 (18) it. Okay. That's fine. Doctor, I know  
 you've  
 (19) probably given a lot of depositions  
 before, I assume.  
 (20) Am I correct?  
 (21) A. Yeah.

## NOTES

(22) Q. And so I'm not going to go  
 through all the  
 (23) rigmarole. I want to start right in to  
 talk about  
 (24) this particular case, and the first thing  
 I want to  
 (25) do, we'll have this marked as Exhibit  
 No. 2, and it's

## Page 4

(1) the notice of the deposition and the  
 subpoena duces  
 (2) tecum, a lot of which I'm sure you've  
 seen before.  
 (3) And what I'm principally interested in  
 is just did you  
 (4) have a chance to take a look at that  
 document, the  
 (5) document requests and everything  
 on it?  
 (6) A. I did.  
 (7) Q. Okay. And did you bring  
 documents responsive  
 (8) to the document requests on there?  
 (9) MR. FUERST: I may be able to help  
 you a  
 (10) little bit with this.  
 (11) MR. JORDAN: Sure.  
 (12) MR. FUERST: Some of those  
 requests asked  
 (13) that documents - or maybe not  
 asked that documents be  
 (14) created, but in order to respond to  
 them he would have  
 (15) had to create a list which he did not  
 create any  
 (16) documents, but he did bring all the  
 documents and  
 (17) materials that are responsive to it that  
 he had in his  
 (18) possession.  
 (19) MR. JORDAN:

(20) Q. Okay. And are those - I see a lot  
 of -  
 (21) several books there. Is that all, or are  
 there also  
 (22) some other documents that -  
 (23) A. [Witness indicating]  
 (24) Q. Okay. I don't suppose you have  
 copies of  
 (25) that stuff, do you? I mean, I'm not  
 talking about

## Page 5

(1) the books. I'm talking about just the  
 stuff you  
 (2) have in the binder.  
 (3) A. No. No, I don't.  
 (4) Q. I don't know if you need that in  
 front of  
 (5) you, but maybe if you don't need it in

front of you

(6) when we're starting, maybe we can get a copy made -

(7) MR. FUERST: Or maybe we can get it copied on

(8) the lunch break.

(9) MR. JORDAN: Okay. That's fine. Let's just

(10) get whatever you have in front of you copied during

(11) the lunch break, and I'll just go through the texts

(12) with you.

(13) Q. I take it that everything that you have in

(14) front of you, including your notes and your books -

(15) and, as counsel has said, you didn't create any lists,

(16) but that's everything that would have been responsive

(17) to all these document requests?

(18) A. Correct.

(19) Q. Okay. All right, Doctor. Bear with me for a

(20) second here, Doctor. Okay. Doctor, how did you first

(21) become involved in this case or who first asked you to

(22) become involved in this case?

(23) A. I believe I received a call from Mr. Fuerst,

(24) and I think that was probably about four or five

(25) months ago.

Page 6

(1) Q. Okay. Mr. Fuerst, the attorney for the

(2) Casales?

(3) A. Right.

(4) Q. And I take it he asked you to perform some

(5) type of analysis for this lawsuit; is that correct?

(6) A. That's correct.

(7) Q. Okay. And what I want to get at is what

(8) specifically did he ask you to do as far as what kind

(9) of analysis you were asked to perform?

(10) A. What I was asked to do was to look at the

(11) exposures that the Casales had suffered and to make a

(12) judgment as to whether they were responsible for the

(13) symptoms and medical problems that they had.

# NOTES

(14) Q. Okay. And we're going to get into this, but

(15) just so we have it right out in front, when you say

(16) "exposures," what exactly are you referring to?

(17) A. I'm talking about the chemicals that were

(18) released during the venting by Hercules Marine

(19) Services.

(20) Q. Okay. And when you say "venting," you mean

(21) having to do with cleaning the barges?

(22) A. Yes.

(23) Q. Okay. Well, we'll get into that more.

(24) Let me ask you this. I assume you're charging a

(25) by-the-hour rate to Mr. Fuerst.

Page 7

(1) A. That's correct.

(2) Q. Okay. What rate are you charging per hour?

(3) A. Depositions are - well, just regular

(4) consultation is 125 an hour.

Deposition is 250 an

(5) hour.

(6) Q. Okay. Have you been asked to testify at the

(7) trial of this matter at this time?

(8) A. Well, I believe so. I don't know. I'm not

(9) sure if I -

(10) Q. And I'm just trying to get at has Mr. Fuerst

(11) or anyone asked you or said, "Doctor, we'd like you to

(12) come and testify at trial at this point?"

(13) A. Well, I mean, we haven't even talked about

(14) it, so -

(15) Q. Okay.

(16) A. I mean, I - my comments then were just based

(17) on, you know, what usually happens regarding an expert

(18) witness.

(19) Q. No, and I understand you usually

(20) differentiate your costs between

(21) analysis time,

(22) deposition time and trial time.

(23) A. Well, trial time would be the same as

(24) deposition.

(25) Q. As deposition?

(26) A. Yes.

Page 8

## NOTES

- (1) Q. You charge the same, which is 250 an hour.
- (2) did you say?
- (3) A. Yes.
- (4) Q. How many hours up to the beginning of this
- (5) deposition have you put into this case, do you know?
- (6) A. About - well, I would say about three or
- (7) four days. That's just an estimate.
- (8) Q. Okay. Roughly three or four eight-hour days.
- (9) is that what we're talking about?
- (10) A. Yeah.
- (11) Q. And I'm going to ask you to do a little
- (12) calculating for me here, but presuming that you are
- (13) asked to testify at trial and not counting this
- (14) deposition, how much time do you think, as an
- (15) estimate, you might have to spend before you testify
- (16) at trial in working on this case?
- (17) A. I would say about two to three days,
- (18) something like that.
- (19) Q. Again, two to three full working days?
- (20) A. Right.
- (21) Q. I understand. When you were asked to begin
- (22) and do your analysis in this, were you asked to make
- (23) any kind of assumptions about the case, about the
- (24) exposure, about anything?
- (25) A. No.

## Page 9

- (1) Q. You were not?
- (2) A. I don't think so.
- (3) Q. Okay. Well, Doctor, let me go ahead and my
- (4) understanding is that the only - that you've produced
- (5) this affidavit, which has been produced to Hercules,
- (6) and you haven't produced any other type of report.
- (7) have you?
- (8) A. No, I haven't.
- (9) Q. Okay. So the only thing you've produced is
- (10) this affidavit?
- (11) A. Correct.
- (12) Q. And what you have in front of you are just

- (13) notes and things like that from your analysis? Is
- (14) that what it is?
- (15) A. That's correct.
- (16) Q. Okay. Did you have any prior drafts of this
- (17) affidavit, or is this the only draft?
- (18) A. I think what I have - what I have in my
- (19) possession is one just prior to the final draft,
- (20) but -
- (21) Q. Okay.
- (22) A. - I'm not sure.
- (23) Q. Is it -
- (24) A. So I don't have - I mean, I don't have like
- (25) the original handwritten copy or anything.

## Page 10

- (1) Q. Okay. Was that something that you had at one
- (2) time, or would it be in those notes or -
- (3) A. I believe I had it. I - let's see, if
- (4) you - you know, if you want, I could -
- (5) Q. I'll tell you what.
- (6) A. Okay.
- (7) Q. If the prior draft is in amongst those
- (8) materials, we're going to get a copy of those at
- (9) lunchtime, so I can have a chance to go over it.
- (10) I was just curious from your memory whether you had
- (11) one prior draft, two prior drafts that were in your
- (12) notes or just this one that you're talking about.
- (13) A. I think, as I recall, it was one prior draft
- (14) which was faxed to Mr. Fuerst's firm and then a couple
- (15) of minor changes were made.
- (16) Q. Okay. I take it you just -
- (17) A. So I think that the one I have is -
- (18) Q. Okay.
- (19) A. Well, I'm not entirely sure if it's the final
- (20) one or -
- (21) Q. Okay.
- (22) A. But, anyway, you could compare it.
- (23) Q. There's one in there, so I take it you sent
- (24) it to Mr. Fuerst, and you all discussed it, and then

(25) you came up with this final version?

Page 11

(1) A. Yeah, some minor changes.

(2) Q. Did you prepare the report yourself, or do

(3) you have an assistant or anybody that -

(4) A. The affidavit? I prepared it myself, yes.

(5) Q. And I guess the only person that would have

(6) had input is just in the conversations you would have

(7) had with Mr. Fuerst?

(8) A. It was either Mr. Fuerst or Mr. McDowell, I'm

(9) not sure which.

(10) Q. But, in other words, I'm just trying to get

(11) anybody who would have had input into the making of

(12) the affidavit itself other than Mr. Fuerst and

(13) Mr. McDowell.

(14) A. No.

(15) Q. Nobody, just you and them? Okay. Let me -

(16) I want to go ahead and start going through your report

(17) with you. I don't know if you have the - I'm sorry,

(18) I keep saying report. And, if you'll forgive me, if I

(19) say report, I mean affidavit. Let me go through your

(20) affidavit.

(21) A. Okay. I have it here.

(22) Q. Okay. Doctor, you're currently a professor

(23) of environmental toxicology, is that true?

(24) A. Yes.

(25) Q. Do you have an undergraduate degree in

Page 12

(1) toxicology?

(2) A. No, I don't.

(3) Q. Okay.

(4) A. My undergraduate degree and my graduate

(5) degrees are in chemistry and biochemistry.

(6) Q. Okay. And you may have anticipated my next

(7) question, which is: Did you get a graduate degree in

(8) toxicology?

(9) A. No, I did not. My Ph. - my masters is an MS

# NOTES

(10) in biochemistry and a Ph.D. in chemistry.

(11) Q. Okay. And let me ask you, I understand

(12) you're now a professor of that. What education did

(13) you have in toxicology specifically?

(14) A. I've had a lot of on-the-job experience, both

(15) at - when I was at Drexel University in Philadelphia

(16) and at University of Texas Medical Branch, so that -

(17) I did a substantial amount of reading, I made trips to

(18) NIOSH, EPA and became familiar with the kind of work

(19) that was being done in the field, and I taught some

(20) courses and took some courses in that area.

(21) Q. Okay. And so you know what I'm getting at,

(22) it sounds like you've had some courses, and I was

(23) really just trying to get at what particular

(24) educational background you have in toxicology. Is

(25) that - and the only thing I heard in there was that

Page 13

(1) you mentioned you had a few courses in it.

(2) A. Well, I've had courses in toxicology. I was

(3) on the faculty in the department of pharmacology, and

(4) so I taught - I taught the medical and graduate

(5) students -

(6) Q. I'm sorry, and I don't mean to interrupt

(7) you. I was going to ask you if you could remember off

(8) the top of your head or if you remember what courses

(9) you had that you took in toxicology.

(10) A. Well, I think I said toxicology and -

(11) Q. Do you remember where you took them or what

(12) university?

(13) A. Well at UTMB.

(14) Q. Okay. All right.

(15) A. Yeah.

(16) Q. Do you have a memory of when that was or when

(17) you did those?

(18) A. Through the years.

(19) Q. Okay. So you don't have a specific memory of  
 (20) a year or -  
 (21) A. No.  
 (22) Q. Let me go ahead and go through with you  
 (23) briefly, you know, how you've gained your knowledge  
 (24) of the facts of this case, because it's noted in your  
 (25) affidavit. It says that you've gained your knowledge

Page 14

(1) of the facts of this case by, No. 1, meeting and  
 (2) interviewing Mr. and Mrs. Casale; is that correct?  
 (3) A. Correct.  
 (4) Q. Okay. Where did you meet them? Did you meet  
 (5) them at their house or -  
 (6) A. At their house, yes.  
 (7) Q. Do you remember when that was?  
 (8) A. Yeah, I have - it was November 4th, 1997.  
 (9) Q. Do you remember how long it was that you met  
 (10) with them for?  
 (11) A. Oh, several hours.  
 (12) Q. Okay.  
 (13) A. Probably about approximately two or two and a  
 (14) half hours.  
 (15) Q. Okay. And can you tell me - just give me a  
 (16) basic idea of the content of that conversation, what  
 (17) it was you discussed with them?  
 (18) A. They talked to me about the operation that  
 (19) Hercules had. They showed me a tape, a videotape  
 (20) that they had. And they - as I say, they described  
 (21) about - they described the various problems that they  
 (22) had.  
 (23) Q. What did they tell you about Hercules'  
 (24) operation?  
 (25) A. They told me that the operation started in

Page 15

(1) 1989, that they had moved in there in 1981, and that  
 (2) the operation was - was one of cleaning tanks on  
 (3) barges, which included venting of volatile materials

# NOTES

(4) as well as sandblasting.  
 (5) Q. And these were things that they were saying  
 (6) they saw personally?  
 (7) A. Yes, and, I mean, I saw them - I saw it on  
 (8) the videotape and some pictures of -  
 (9) Q. And I think we have that videotape. They  
 (10) showed you the videotape they had taken?  
 (11) A. Yes.  
 (12) Q. And you said they discussed their problems.  
 (13) Is that that they discussed the physical illnesses  
 (14) that they had?  
 (15) A. Correct.  
 (16) Q. Okay. They said they moved in there in 1981  
 (17) and that Hercules had started their work in 1989?  
 (18) A. Correct.  
 (19) Q. The illnesses, et cetera, that they were  
 (20) talking to you about, did they say that any of those  
 (21) illnesses had predated when Hercules -  
 (22) A. I don't believe so. They didn't - at least  
 (23) that was not indicated.  
 (24) Q. So I want to be - is according to what they  
 (25) told you, all the illnesses they had suffered had come

Page 16

(1) after Hercules had begun their operation?  
 (2) A. Yes.  
 (3) Q. And that they attributed their illnesses to  
 (4) Hercules?  
 (5) A. Yes.  
 (6) Q. And we've just talked about viewing their  
 (7) videotape. Did you view that at their house, or did  
 (8) they give you a copy?  
 (9) A. No, at their house.  
 (10) Q. You've reviewed their affidavits?  
 (11) A. Yes.  
 (12) Q. It says that you saw the facilities of  
 (13) Hercules. Is this when you went out and visited the  
 (14) Casales that you saw Hercules' facilities?  
 (15) A. Well, I just saw it - I saw it on tape and

(16) just driving around in the area. I believe we drove  
(17) around and - or they pointed it out to me. It was  
(18) not a - you know, it wasn't a tour of the facilities  
(19) or anything.  
(20) Q. Right, so you haven't actually been on the  
(21) facility?  
(22) A. No.  
(23) Q. You've driven past it?  
(24) A. Yes, right.  
(25) Q. And would that have been around the time that

Page 17

(1) you were at the Casales?  
(2) A. Yes.  
(3) Q. Around November 1997? Is that accurate,  
(4) November 1997?  
(5) A. Correct.  
(6) Q. It says reviewing the documents Hercules  
(7) produced in response to requests for production. Did  
(8) you review all the documents that Hercules produced or  
(9) only certain documents?  
(10) A. Okay. I - what I reviewed was a chronology  
(11) of barges serviced by Hercules.  
(12) Q. Okay. Anything else?  
(13) MR. FUERST: That was all in those -  
(14) A. Yeah, I think - well, I - I reviewed the  
(15) deposition of Mr. Claudio Duarte.  
(16) Q. Okay.  
(17) A. I think I had - this is not from Hercules,  
(18) but I believe I had reviewed Mr. Casale's deposition  
(19) a while ago.  
(20) Q. Okay. Mr. Casale's?  
(21) A. Yes, I think.  
(22) Q. Did you ever review Mrs. Casale's?  
(23) A. I don't think so.  
(24) Q. Okay.  
(25) A. Okay.

Page 18

(1) Q. I'm sorry, I didn't mean to interrupt you.  
(2) A. That's all right.  
(3) Q. I just wanted to be sure I understand the  
(4) documents you reviewed. And I'm leaving aside medical  
(5) and those kind of things that are in

NOTES

your field of  
(6) expertise.  
(7) A. Right.  
(8) Q. I'm talking about knowing about the facts  
(9) of this case, documents you reviewed, and it sounds  
(10) the chronology of barges serviced by Hercules, the  
(11) deposition of Mr. Duarte and the deposition of  
(12) Mr. Casale.  
(13) A. Correct.  
(14) Q. Are there any other documents generated in  
(15) this case that you reviewed?  
(16) A. Well, the two affidavits I mentioned.  
(17) Q. Oh, I'm sorry.  
(18) A. Yeah.  
(19) MR. FUERST: I think he looked through those  
(20) boxes that Hercules produced, too. Didn't you look  
(21) through those?  
(22) THE WITNESS: That's what I'm not - I'm not  
(23) entirely sure if I -  
(24) MR. JORDAN:  
(25) Q. Do you just not remember one way or the other.

Page 19

(1) or -  
(2) A. I'm just not sure. You know, if I saw the  
(3) material in the box, I might remember, but -  
(4) Q. You're just not sure?  
(5) A. Yeah.  
(6) Q. I understand. I meant to ask you this  
(7) before. When you were driving past Hercules'  
(8) facility, about how far away were you from it? You  
(9) can give me an estimate. Half a mile?  
(10) A. Well, I don't remember precisely, but I think  
(11) probably about - you mean from their house, is that  
(12) what you're saying?  
(13) Q. Well, no, you said you had driven by the  
(14) facility, and I'm talking about then.  
(15) A. Oh, well, from their house.  
(16) Q. Okay. And maybe I misunderstood you.  
(17) A. No.  
(18) Q. When you were talking about driving near the

(19) facility, I thought that this was two separate things,  
 (20) that you had been to their house and you had also  
 (21) driven in some area near the facility.  
 (22) A. No.  
 (23) Q. About how far, from your estimate, is their  
 (24) house from the facility?  
 (25) A. I would say somewhere between 100 and 500

Page 20

(1) meters. I can't -  
 (2) Q. That's fine. I just wanted to get your  
 (3) estimate.  
 (4) A. Yeah.  
 (5) Q. What did you see or did you see anything that  
 (6) you felt like was significant when you were looking at  
 (7) the facility?  
 (8) A. No, I didn't.  
 (9) Q. Nothing that you saw that was significant for  
 (10) your affidavit?  
 (11) A. No.  
 (12) Q. Let me go ahead and - page 2 of your  
 (13) affidavit you state that you believe the exposures  
 (14) suffered by Mr. and Mrs. Casale over an eight-year  
 (15) period have been a constant nuisance to them severely  
 (16) impacting on their quality of life.  
 (17) A. Right.  
 (18) Q. Okay. And so that you know what I'm going  
 (19) to be doing, is I'm just going to break down each  
 (20) part and figure out what it is for each one of your  
 (21) conclusions that you're basing it on. You understand?  
 (22) A. Yes.  
 (23) Q. I'm sorry, that's the first sentence, and  
 (24) what I want to ask you is that particular conclusion  
 (25) you reached, can you tell me what exactly that was

Page 21

(1) based on?  
 (2) A. I must have missed - what are you referring  
 (3) to?  
 (4) MR. FUERST: He's right here.  
 (5) MR. JORDAN:

# NOTES

(6) Q. I'm at the very top of page two.  
 (7) A. All right.  
 (8) Q. Which is where you begin basically your  
 (9) conclusions.  
 (10) A. Okay. You're asking what are the exposures,  
 (11) then?  
 (12) Q. Well, I'm asking - I guess what I'm asking  
 (13) you is that you say over an eight-year period you're  
 (14) saying it was a constant nuisance to them -  
 (15) A. Yes.  
 (16) Q. - severely impacting on their quality of  
 (17) life.  
 (18) A. Right.  
 (19) Q. And that conclusion, I'm asking you what  
 (20) exactly that is based on.  
 (21) A. Yes, that's based on what they told me,  
 (22) their affidavits and the videotape, and the particular  
 (23) aspects of the operation that caused that nuisance  
 (24) were first of all release of malodors.  
 (25) Q. And, Doctor, I don't mean to interrupt

Page 22

(1) you, -  
 (2) A. I'm sorry, go ahead.  
 (3) Q. - but you're actually getting into the  
 (4) question I'm about to ask you. But what I want to  
 (5) be sure I've done first is to get through exactly  
 (6) everything -  
 (7) A. Yes, sorry.  
 (8) Q. It sounds to me like the things you were  
 (9) basing that conclusion on were what they told you,  
 (10) their affidavits and the videotape that you reviewed.  
 (11) A. Correct.  
 (12) Q. And that's everything that you are basing  
 (13) that conclusion on?  
 (14) A. Right. Now, I saw - Duarte's deposition I  
 (15) reviewed after I wrote the affidavit.  
 (16) Q. After?  
 (17) A. Yes.  
 (18) Q. Okay. Would that - would Mr. Duarte's

- (19) affidavit, would that add anything to that particular  
 (20) conclusion?  
 (21) MR. FUERST: Deposition.  
 (22) MR. JORDAN:  
 (23) Q. I'm sorry, his deposition, would that add  
 (24) anything to that conclusion?  
 (25) A. No, I don't think so.

## Page 23

- (1) Q. And I'm sorry I broke it down. You were  
 (2) about to tell me what exactly it was that was causing  
 (3) that nuisance.  
 (4) A. Okay. What, in my opinion, contributed to  
 (5) the nuisance situation were, first of all, the -  
 (6) their claim of release of odors, the noise from  
 (7) the sandblasting operation, particles from the  
 (8) sandblasting operation which caused a reduction  
 (9) in visibility, plus symptoms they had which were  
 (10) attributed to the release of materials.  
 (11) Q. And when you say "symptoms," you mean  
 (12) medical -  
 (13) A. Yes.  
 (14) Q. - problems?  
 (15) A. Yes.  
 (16) Q. Anything else that you would include in the  
 (17) nuisance?  
 (18) A. Well, their quality of life was affected  
 (19) because of - well, did I mention the loud noises?  
 (20) Loud noises from the sandblasting. Yeah, I think I  
 (21) said that.  
 (22) Q. Yes, you did.  
 (23) A. Okay. Their quality of life was impacted  
 (24) because of these disturbances and because of residual  
 (25) health effects from the operations, and that includes

## Page 24

- (1) an impact on sleeping and other things that one  
 (2) normally does.  
 (3) Q. Okay. So you would include that maybe in the  
 (4) medical, those kind of things?  
 (5) A. Well, it's - you know, it could be

## NOTES

- partly  
 (6) medical, but it could also be a factor by itself, in  
 (7) other words, an interference with sleeping.  
 (8) Q. Okay. And so you know, I was about to ask  
 (9) you for your definition of two words, because - well,  
 (10) the first one is the one that has a legal definition,  
 (11) and I'm certainly not going to ask you for that. I  
 (12) know you're not a lawyer. But when you say nuisance,  
 (13) what do you mean by nuisance?  
 (14) A. I mean that it - the operation disturbed  
 (15) them and interfered with their quality of life.  
 (16) Q. Okay. And that was my second question, is  
 (17) when you say quality of life, tell me what - exactly  
 (18) what you mean when you say their quality of life.  
 (19) A. Quality of life is doing - having activities  
 (20) that one normally has, enjoying these activities and  
 (21) having good health, presumably if you had it before,  
 (22) that - and none of these would be interfered with if  
 (23) there was no nuisance.  
 (24) Q. I understand. So part of it is affects on  
 (25) good health that were not preexisting?

## Page 25

- (1) A. Yes.  
 (2) Q. Let me go back to one thing real quickly  
 (3) that I meant to ask you about. In talking about the  
 (4) documents that you reviewed, you say those are the  
 (5) type of records customarily relied upon by  
 (6) environmental toxicologists. What type of records  
 (7) are you specifically talking about that environmental  
 (8) toxicologists typically rely upon in rendering  
 (9) opinions?  
 (10) A. Oh, okay.  
 (11) Q. And, I'm sorry, I should have referred you -

(12) this is the bottom of the first page of your  
 (13) affidavit.  
 (14) A. Yeah. Okay. Where in - there was a list of  
 (15) chemicals in the various operations that was released  
 (16) by Hercules.  
 (17) Q. Okay. Was that in the Hercules documents  
 (18) or -  
 (19) A. I received this from the attorney. I assume  
 (20) that this was prepared by Hercules in response to -  
 (21) Q. And so you understand what I'm talking about,  
 (22) Doctor, that last sentence, because you're saying the  
 (23) subject matter of Hercules' records that you reviewed  
 (24) which described chemicals released are the types of  
 (25) records customarily relied upon by environmental

## Page 26

(1) toxicologists in rendering opinions with regard to  
 (2) causation in chemical exposure matters. So I was  
 (3) assuming that -  
 (4) A. I'm not sure I understand the question.  
 (5) Q. And so that you know, here's what I'm getting  
 (6) at. Your last sentence says that there are documents  
 (7) that Hercules produced that you looked at having to do  
 (8) with chemicals that you say are the type of records  
 (9) customarily relied upon by environmental toxicologists  
 (10) in rendering opinions with regard to causation in  
 (11) chemical exposure matters. And I guess what I'm  
 (12) asking you is do you know exactly what records of  
 (13) Hercules you reviewed or you're talking about that  
 (14) environmental toxicologists -  
 (15) A. Well, I was talking about this document  
 (16) here.  
 (17) MR. FUERST: And perhaps I can help y'all  
 (18) clear this up. This was created as a result of a

## NOTES

(19) review of all the documents that Hercules produced,  
 (20) and Dr. Trieff looked through those documents, but  
 (21) this document is sort of a summary, I think, of what's  
 (22) in there.  
 (23) MR. JORDAN: Okay. Let me -  
 (24) MR. FUERST: I don't think - that wasn't  
 (25) prepared by Hercules.

## Page 27

(1) THE WITNESS: Okay. Well, that's - yeah.  
 (2) MR. FUERST: That was prepared by  
 (3) Mr. Eggleston's office.  
 (4) MR. JORDAN: Okay. But it was based on the  
 (5) Hercules documents?  
 (6) MR. FUERST: Yeah.  
 (7) MR. JORDAN: Okay.  
 (8) Q. And, Doctor, what we'll do is we'll go  
 (9) ahead and attach this as Exhibit 3. I'll keep it  
 (10) organized. And it looks like what Exhibit 3 was is  
 (11) a compilation that was done by the Casale's attorneys  
 (12) based on Hercules' records of barges serviced and  
 (13) chemicals that may have been involved in that. Is  
 (14) this the document you're talking about? Exhibit 3.  
 (15) Is this the document you're talking about?  
 (16) A. Yes.  
 (17) Q. And you're saying that based on that  
 (18) document, Exhibit 3, that's the document that  
 (19) you're saying would be typically relied upon by -  
 (20) customarily relied upon, I'm sorry, by environmental  
 (21) toxicologists in rendering opinions -  
 (22) A. Correct.  
 (23) Q. - with regard to causation in  
 (24) chemical exposures?  
 (25) A. Yeah, I mean, it wouldn't have to be exactly

## Page 28

(1) in this form but something to indicate what exposures  
 (2) occurred.  
 (3) Q. Okay. And as I look at this document, it  
 (4) indicates - it only indicates chemicals

removed as

(5) far as what the chemicals are.

(6) A. Yes.

(7) Q. It doesn't indicate amount of chemical or

(8) anything like that, does it?

(9) A. In some cases the amount is indicated.

(10) Q. Okay. Let me see. So when it says - and

(11) this is on Exhibit 3 under the column that says "waste

(12) water disposed."

(13) A. Yes.

(14) Q. Does that have something to do with the

(15) amount of chemicals removed? And you can educate me

(16) on this, because I don't know.

(17) A. Well, my understanding of that is that this

(18) is the amount of waste water that was resulted from

(19) the cleaning out of the barges.

(20) Q. Does that tell you - the amount of waste

(21) water disposed, does that tell you the amount of

(22) chemical removed?

(23) A. No, but it tells - well, what it tells you

(24) is that the waste water was dissolved in that or could

(25) have been dissolved in that amount and probably the -

#### Page 29

(1) you know, the larger the amount of waste water, either

(2) the larger the amount of chemical or the less soluble

(3) it was in the water -

(4) Q. Okay.

(5) A. - used to dispose of it.

(6) Q. I guess what I'm getting at is it fair to

(7) say for each one of the chemicals that are listed out

(8) on Exhibit 3 as the chemical removed, we really can't

(9) know exactly how much of that chemical was removed.

(10) Is that fair to say?

(11) A. No, there's no concentration listed, no.

(12) Q. So we don't know how much was removed?

(13) A. Right.

(14) MR. FUERST: Go off the record for a second.

#### NOTES

(15) MR. JORDAN: Sure.

(16) [Discussion off the record]

(17) [Exhibit 1 marked, Trieff curriculum vitae]

(18) [Exhibit 2 marked, notice of deposition with

(19) subpoena duces tecum]

(20) MR. JORDAN:

(21) Q. Doctor, they're making a copy of Exhibit 3 so

(22) that you and I can talk about it a little bit. Let me

(23) ask you while they're doing that, in the course of

(24) your analysis, did you review any air emission data?

(25) A. No, I did not.

#### Page 30

(1) Q. Or air sampling data, did you review anything

(2) like that?

(3) A. Not to my knowledge, no.

(4) Q. And I'm going to get into this with each

(5) chemical with you, but did you review any data

(6) concerning the chemical composition of each material

(7) emitted?

(8) A. No, I didn't.

(9) Q. And so you know what I'm talking about, I

(10) mean like, for instance, cyclohexane and some of these

(11) other things, did you review any data on the chemical

(12) composition of cyclohexane or any of the other

(13) chemicals listed?

(14) A. I don't recall having reviewed such documents.

(15) Q. Okay. What about have you reviewed any data

(16) concerning the physical characteristics of any of this

(17) material emitted?

(18) A. No.

(19) Q. Have you reviewed - and I know that the

(20) Casales talked to you about what kind of ailments they

(21) had, but have you personally reviewed any of their

(22) medical records?

(23) A. I don't believe I saw the medical records.

(24) Q. Okay. So the only thing you had to go on as

#### Page 31

(1) far as their medical was what they told you and their  
 (2) affidavits?  
 (3) A. Yes.  
 (4) Q. And possibly Mr. Casale's deposition?  
 (5) A. Correct.  
 (6) [Exhibit 3 marked, fax from Eggleston to  
 (7) Trieff, dated 4-8-98, with enclosed Chronology of  
 (8) Barges Serviced by Hercules]  
 (9) MR. JORDAN:  
 (10) Q. Okay. Doctor, let's just come back to  
 (11) Exhibit 3 very briefly. And you noted before that we  
 (12) can't know for each one of these chemicals under the  
 (13) heading of chemicals removed how much of that chemical  
 (14) was removed from each one of these barges. Is that  
 (15) fair to say?  
 (16) A. Yes.  
 (17) Q. And you know what? I'll come back to this  
 (18) document a little bit later. Let me ask you this. In  
 (19) preparing your affidavit, did you conduct any type of  
 (20) literature searches?  
 (21) A. At that point, I had not, but I - I had  
 (22) the list of - the list of chemicals, and I was  
 (23) sufficiently familiar with properties of at least  
 (24) some of them that I was able to write the affidavit.  
 (25) Q. Okay. It sounds - and I may be mistaken

## Page 32

(1) what you just told me, but it sounds like before you  
 (2) did your affidavit you didn't do any literature  
 (3) searches, but since then you have, or am I misstating  
 (4) what you told me?  
 (5) A. No, that's correct.  
 (6) Q. What type of searches have you done since  
 (7) the time you made your affidavit?  
 (8) A. Okay. I first looked through the  
 (9) Encyclopedia of Chemical Technology, and I looked for  
 (10) a brief discussion of at least some of the - some of

## NOTES

(11) the compounds as well as physical properties that were  
 (12) of concern in this case. And so I - I have that  
 (13) here.  
 (14) Q. Okay. Okay. Good. I was going to ask you  
 (15) have a copy of that search?  
 (16) A. Yes. And then I went through the library  
 (17) recently to get a little more information on some of  
 (18) the chemicals, especially with regard to either  
 (19) neurological effects or and/or liver effects, and  
 (20) I've got these documents here. I've got the books  
 (21) with an indication of - with indications of what  
 (22) was discussed in each.  
 (23) Q. Okay. And so those are books from the  
 (24) library?  
 (25) A. Yes.

## Page 33

(1) Q. The books you have in front of you?  
 (2) A. Yes, our library.  
 (3) Q. And those are books that you checked out  
 (4) and flagged for the different things that you found?  
 (5) A. Yes.  
 (6) Q. And we'll come back to that. I just want  
 (7) to make sure I close the circle on this. All the  
 (8) literature searches you've conducted we've discussed.  
 (9) You have the one where you went to the Encyclopedia  
 (10) of Chemical Technology and made a copy of that which  
 (11) we'll copy during the lunch break?  
 (12) A. Correct.  
 (13) Q. And also you went to the library and you took  
 (14) out copies of a bunch of books?  
 (15) A. Yes.  
 (16) Q. And we'll go through those, and we'll be able  
 (17) to go through those a little later. Is there anything  
 (18) else, any other type of literature search you've  
 (19) conducted since you made your affidavit?  
 (20) A. No, that's it.

- (21) Q. Okay. And let me ask you this also. I  
 (22) meant to ask you this earlier. Have we covered  
 (23) everything - all the different documents that you  
 (24) reviewed both before your affidavit and since the  
 (25) time of your affidavit?

Page 34

- (1) A. I believe so, yes.  
 (2) Q. Okay. And let me make sure I've got this  
 (3) right. Before you made your affidavit, you had the  
 (4) Chronology of Barges Serviced by Hercules, the  
 (5) deposition of Mr. Duarte, Mr. Casale's deposition -  
 (6) A. No, I didn't have Mr. Duarte's deposition. I  
 (7) had Mr. Casale's.  
 (8) Q. And the deposition of Mr. Duarte was after  
 (9) the affidavit?  
 (10) A. Right.  
 (11) Q. And you had the affidavits of Mr. and  
 (12) Mrs. Casale before you made your affidavit?  
 (13) A. Correct.  
 (14) Q. And since then was there any literature that  
 (15) we haven't talked about that you looked at before you  
 (16) made your affidavit?  
 (17) A. Well, I looked at - I looked at this book  
 (18) of mine with regard to interactions, and this is -  
 (19) Q. Okay. And this is a book that you - this is  
 (20) your book, Environment and Health?  
 (21) A. Right.  
 (22) Q. And this book you reviewed prior to making  
 (23) your affidavit?  
 (24) A. Yes, I - a particular part of it on  
 (25) interactions.

Page 35

- (1) Q. Okay. All right. And the name of that book  
 (2) again is Environment and Health?  
 (3) A. And Health, yes.  
 (4) Q. And it's published by Ann Arbor Science?  
 (5) A. Yes.  
 (6) Q. 1980. Any other books or literature you

# NOTES

- (7) remember reviewing prior to making your affidavit?  
 (8) A. I don't believe so.  
 (9) Q. Okay. And we've just discussed all the  
 (10) literature that you looked at since the time that you  
 (11) made your affidavit?  
 (12) A. Yes.  
 (13) Q. Encyclopedia and these other books from the  
 (14) library that we'll go through, and Mr. Duarte's  
 (15) deposition.  
 (16) A. Correct.  
 (17) Q. Did you at any time - I know you haven't  
 (18) prepared a list of documents or anything. Did you  
 (19) at any time prepare a bibliography of the different  
 (20) references you've used in making your opinions in  
 (21) this case?  
 (22) A. No, I didn't.  
 (23) Q. Okay. In your notes that you have there or  
 (24) at your office do you have copies of any paper or  
 (25) treatise that you relied upon?

Page 36

- (1) A. I do have some notes that I made in looking  
 (2) through documents. Is that what you mean or not?  
 (3) Q. No, I guess what I'm getting at is you've  
 (4) talked about books, and also I can't tell from here if  
 (5) in your notes you have specific scientific papers or  
 (6) articles in there. Do you have -  
 (7) A. I have listed - I've listed some, but I -  
 (8) although I didn't - I did not actually get copies of  
 (9) any of them.  
 (10) Q. Okay. But you have a list of other  
 (11) scientific documents -  
 (12) A. Of some, yes.  
 (13) Q. All right. So it sounds like you have a list  
 (14) there of some scientific articles that you relied  
 (15) upon, and then we have the books we're going to go  
 (16) through. Does your list cover all of the scientific  
 (17) articles that you relied upon in

making your opinions?

- (18) A. No. I - I mainly, in preparation for this
- (19) deposition, looked at these various books with regard
- (20) to the neurotoxic properties of compounds which were
- (21) in the barges and also hepatotoxic properties, in
- (22) other words, to see which had hepatotoxic properties,
- (23) which had neurotoxic properties.
- (24) Q. Okay. As long as we're right here, why don't
- (25) I have you help me out, and when you say "hepatotoxic"

Page 37

- (1) properties," what do you mean?
- (2) A. Liver toxic.
- (3) Q. And when you say "neurotoxic," you mean?
- (4) A. Toxic to the nervous system, either the
- (5) central or peripheral.
- (6) Q. Okay. I'll tell you what, probably when
- (7) we're - probably around the end of the deposition I'm
- (8) going to go through the references that you relied
- (9) upon, because then I'll have a copy of your list and
- (10) everything, -
- (11) A. Sure.
- (12) Q. - and anything that's not listed on there,
- (13) we can talk about.
- (14) Let me go to your - again go to page 2 of
- (15) your affidavit and talk about the second sentence is
- (16) where we get at the heart of, it looks like, your
- (17) opinion. And basically the second sentence on page 2
- (18) of your affidavit says that the exposures of loud,
- (19) high-pitched noises due to sandblasting, dust composed
- (20) of silica, et cetera, noxious odors caused by and
- (21) including carcinogens, benzene, styrene, et cetera,
- (22) et cetera, caused a series of medical problems that
- (23) are indicated in the affidavit and that I'm going to
- (24) want to go through with you.
- (25) A. Yes.

NOTES

Page 38

- (1) Q. The first thing I want to ask you is, though,
- (2) as a toxicologist, as a professor of toxicology, are
- (3) you familiar with the elements necessary to establish
- (4) causation from a chemical exposure?
- (5) A. Yes.
- (6) Q. Okay. Can you tell me what those are?
- (7) A. That the - first of all, that there is a
- (8) connection established in the literature between the
- (9) exposure and the disease, that the exposure is of
- (10) sufficient quantity and time to permit that - to
- (11) permit the development of pathology, and, let's see,
- (12) and, third, that it's biologically plausible, I guess,
- (13) which overlaps to some degree what the second item
- (14) was.
- (15) Q. Okay. And let me have you, if you can,
- (16) expound on that for me. When you say "biologically
- (17) plausible," can you tell us what you mean?
- (18) A. That it is reasonable from a biological point
- (19) of view that these exposures would cause the diseases
- (20) in question, for example, that the - if cancer was -
- (21) let's say cancer was a problem, then there would have
- (22) to be a sufficient latency period between exposure and
- (23) development of the disease for it to occur. I mean,
- (24) there isn't a claim of cancer in this case, but that
- (25) would - so that - that would be one element of

Page 39

- (1) biological plausibility.
- (2) Q. And maybe I can break it down this way,
- (3) because it sounds like, as you're saying, there is
- (4) an overlap, and you were giving me examples.
- (5) A. Yeah.
- (6) Q. So maybe the way for me to ask is to say
- (7) leaving aside that the exposure has

to be of

(8) sufficient quantity and time to permit the development

(9) of pathology as you just said, and that's part of the

(10) biological plausibility, what else is part of the

(11) biological plausibility?

(12) A. Well, as an example, it might be something

(13) like if there was no evidence in the literature that,

(14) say, the chemical caused problems in males, it only

(15) caused chemicals [sic] in females, and this was a male

(16) person that was a plaintiff, then that would be - you

(17) know, that might be an element of nonplausibility.

(18) Q. Okay.

(19) A. So that's what I meant.

(20) Q. Okay. So it sounds like maybe that

(21) biological plausibility may be something that's more

(22) case-specific?

(23) A. Yeah, partly, yeah.

(24) Q. Because I'm trying to see if you can give me,

(25) other than by way of example, what other things -

#### Page 40

(1) A. Well, you know, it really overlaps with the

(2) first point, that there should be some evidence in the

(3) literature that that particular exposure will cause

(4) either the symptoms or disease in question.

(5) Q. Okay. So it would be fair to say that maybe

(6) that third point, biologically plausible, is really

(7) the combination of the first two points, that there

(8) has to be the connection in literature between the

(9) exposure and the ailment, and then that the exposure

(10) has to be of sufficient quantity and time for the

(11) pathology and that those two together equal biological

(12) plausibility?

(13) A. I think that's a reasonable way of putting

(14) it, yeah.

#### NOTES

(15) Q. Okay. And that's what I'm trying to get at,

(16) is if there's anything else that we're leaving out

(17) that in your mind is another element that's necessary

(18) to establish causation for a chemical - from a

(19) chemical exposure.

(20) A. No, I think that's it.

(21) Q. Okay. Is there any part of that analysis

(22) where you would say that alternative causes have to be

(23) ruled out?

(24) A. They either have to be ruled out or there

(25) has - there has to be some evidence that it was -

#### Page 41

(1) that the two occurred - that both occurred. In other

(2) words, for example, it could be exacerbation of a

(3) preexisting disease. Obviously, the, you know, timing

(4) is a factor. In other words, if the - if the person

(5) had the disease prior to the exposure and it was a

(6) preexisting disease, then it wouldn't - you know,

(7) unless the disease got much worse, then it wouldn't be

(8) a factor.

(9) Q. Then it wouldn't - then, as you're saying,

(10) it wouldn't be caused by the exposure?

(11) A. Yeah.

(12) Q. Right?

(13) A. But sometimes, for example, some individual

(14) might have, say, a tendency towards bronchitis and

(15) may have had it, you know, had cases a few times, but

(16) then after exposure to some toxic and/or irritating

(17) agents, the individual has bronchitis at a much more

(18) frequent - much more frequently, then you could say

(19) that the exposure exacerbated the condition.

(20) Q. I see what you're saying. And, actually, let

(21) me get at that and say what method - let me have you

- (22) tell us what method you use to determine whether a  
 (23) chemical is the cause of an illness or whether the  
 (24) illness occurred as a result of some other cause?  
 (25) A. Well, what I tend to look at is - I'm going

Page 42

- (1) to make a general statement, if that's all right.  
 (2) Q. Sure.  
 (3) A. Is the frequency of occurrence. If  
 (4) someone - if a particular disease, you know, tends  
 (5) to be mostly caused by other factors, then it probably  
 (6) would not likely be caused by the exposure. Just as  
 (7) an example, exposures can sometimes lead to  
 (8) hypertension, but the main cause for hypertension is,  
 (9) you know, just a spontaneous sort of idiopathic, that  
 (10) is, it's not really known what the cause is, but it's  
 (11) a frequent occurrence. A lot of people do tend to  
 (12) have hypertension. So that - in other words, if  
 (13) that was - you know, if that were one of the  
 (14) conditions that the plaintiffs were complaining about,  
 (15) I would have questions about that, because it's more  
 (16) likely than not caused by other things.  
 (17) Q. Hypertension is high blood pressure?  
 (18) A. Yeah.  
 (19) Q. All right. So you mentioned that frequency  
 (20) of occurrence is one thing that you look at to  
 (21) determine whether chemicals can cause an illness or  
 (22) whether it occurs as a result of some other cause?  
 (23) A. Yes.  
 (24) Q. Is there anything else that you look at?  
 (25) A. Well, obviously, if I had the - you know,

Page 43

- (1) the previous medical history, I would look at that.  
 (2) And so if they had a preexisting

# NOTES

condition.

- (3) Q. Yeah, I was going to have you -  
 (4) A. Life-style would be a factor, too.  
 For  
 (5) example, if, you know, someone had a certain  
 (6) life-style that may have contributed to their  
 (7) problems, then that doesn't rule out effect from  
 (8) the exposure, but it certainly indicates that part  
 (9) of their problems was due to life-style.  
 (10) Q. Uh-huh. And when you say "life-style," can  
 (11) you give me - you've been very good at giving us some  
 (12) examples.  
 (13) A. The example would be, say, smoking, drinking,  
 (14) lack of exercise, obesity, stuff like that.  
 (15) Q. Okay. Let me ask you this. When you spoke  
 (16) with the Casales and from reviewing their medical -  
 (17) I'm sorry, not their medical records - their  
 (18) affidavits, was there anything about their life-style  
 (19) that struck you that could have been a cause of some  
 (20) of the problem - of any of the problems that they  
 (21) would talk to you about?  
 (22) A. May I look at them?  
 (23) Q. Certainly, sure. Take your time.  
 (24) A. Okay. The - one example indicates that  
 (25) Mr. Casale has high cholesterol.

Page 44

- (1) Q. Right.  
 (2) A. That could have been exacerbated by the  
 (3) exposure or there could have been some indirect  
 (4) effects, but it's also true that he - his cholesterol  
 (5) could have been high prior to the exposures, and I  
 (6) have - I really have no evidence for that. So I -  
 (7) I can't rule out the fact that the - you know, his  
 (8) cholesterol was exacerbated by stress and/or the high  
 (9) exposures, but I also can't - you know, couldn't rule  
 (10) out other causes, unless I saw evidence that, you

- (11) know, his cholesterol was extremely low up until this
- (12) time.
- (13) Q. And, as you said, you haven't seen any of the
- (14) medical records -
- (15) A. No, I haven't.
- (16) Q. - for either Mr. or Mrs. Casale. And would
- (17) you - you would put that high cholesterol into a
- (18) life-style portion, or do you think there would be
- (19) overlap, that would be life-style -
- (20) A. Well, you know, it could - people run
- (21) different levels of cholesterol, and it could be
- (22) life-style, it could be genetic or familial, it could
- (23) be dietary, could be a question of exercise, so yes,
- (24) it could be - it could be life-style, it could be
- (25) genetic, it could be due to the exposures either

Page 45

- (1) directly or indirectly or to all of them, all of them.
- (2) Q. In other words, we just don't know?
- (3) A. No.
- (4) Q. The high cholesterol, we don't really know
- (5) what that was exactly caused from?
- (6) A. Right.
- (7) Q. Any other things about the life-style of
- (8) either Mr. or Mrs. Casale that you think contributed
- (9) to any of the ailments they complained of? And,
- (10) again, Doctor, feel free to take your time.
- (11) A. Well, I don't know. I mean, I don't know,
- (12) for example, the - apparently he had - you know,
- (13) Mr. Casale has had problems with sinus problems,
- (14) problems with sinus, and I - sinus infections, and
- (15) I - I don't know whether that preexisted or was
- (16) exacerbated by these exposures or caused by them. It
- (17) could be any one. In other words, it could have been
- (18) caused by it, it could have been

NOTES

- exacerbated by it,
- (19) or the sinus problems could have preexisted.
- (20) Q. Right. And so it sounds like it's the same
- (21) as the high cholesterol?
- (22) A. Yeah, I'd need to see the - right.
- (23) Q. And without seeing their medical records,
- (24) there's no way for you to know whether this was
- (25) preexisting and had nothing to do with the exposure

Page 46

- (1) or whether the exposure exacerbated it or anything
- (2) like that?
- (3) A. Right.
- (4) Q. And it's certainly possible that the high
- (5) cholesterol and the sinus problems of Mr. Casale
- (6) preexisted the exposure and had nothing to do with
- (7) the exposure?
- (8) A. Yeah, I mean, I would have to see the medical
- (9) records to make a judgment on that.
- (10) Q. And I'm just trying to see if I can get your
- (11) opinion that both of those ailments may very well
- (12) have been preexisting and had nothing to do with the
- (13) exposure?
- (14) A. Or could have, in fact, been caused by it,
- (15) and that would depend on the actual circumstances.
- (16) Q. Okay. So they could have been caused by it
- (17) or they could not have been caused by it. Is that
- (18) fair?
- (19) A. Right.
- (20) Q. Are there any other life-style - and I know
- (21) you're looking at their affidavits. It may be what
- (22) you recall from talking to them, too. I'm talking
- (23) about anything in your conversations with them or
- (24) looking at their affidavits, anything about their
- (25) life-style that you think may have had something to

Page 47

- (1) do with their medical problems that

they talked to

(2) you about, since I know you haven't seen their medical

(3) records?

(4) A. Well, I'm not sure. I don't know how much

(5) exercise they get, for example. I don't know - you

(6) know, I - it's hard for me to evaluate how healthy

(7) their life-style is unless I saw it - you know, was

(8) familiar with what their diet was, what their

(9) activities were and so on.

(10) Q. I mean, for instance, do you know if they

(11) smoke, either one of them?

(12) A. Let me see if I have that information on

(13) that.

(14) Q. Was that something you remember asking either

(15) one of them when you talked to them?

(16) A. Yeah, I'm trying to see if I, in fact,

(17) asked. I should have asked. Let me see. I have no

(18) information as to whether either of them smoked. I -

(19) Q. Do you think - and I would think that that

(20) probably might be important to your analysis. Do you

(21) think you might have asked them that and you don't

(22) remember what they told you or -

(23) A. I don't recall if I did or not. I don't -

(24) you know, I'm surprised that I don't have anything -

(25) any statement in my notes on that.

Page 48

(1) Q. Okay. So you don't know one way or the other

(2) if either of them smoke?

(3) A. No, I don't know.

(4) Q. What about drinking, do you know one way or

(5) the other if either one of them used alcohol?

(6) A. No, I don't know.

(7) Q. Okay. And you said you hadn't seen their

(8) medical records, and that was another thing that you

(9) would want to see in order to rule out possibly other

(10) causes for their ailments. Why do

## NOTES

you say - you can

(11) just give me a broad answer. Why are the medical

(12) records significant for you in determining whether

(13) there may be other causes?

(14) A. Well, as we mentioned, you know, preexisting,

(15) the preexisting conditions. You get information on

(16) general health, family health, so that - in other

(17) words, if, for example, a person developed heart

(18) problems and they were at high risk because their -

(19) the person was at high risk because his father had

(20) early heart problems, then it might rule out effect

(21) due to exposure.

(22) On the other hand, if they started right -

(23) you know, you would have to look at the time

(24) question. If it started shortly after the exposures

(25) began or several years after and there was no problem

Page 49

(1) before, then that would make you think that exposures

(2) must have had something to do with it. So you would

(3) have to look at the, you know, questions of time,

(4) preexisting conditions, familial health and so on.

(5) Q. Doctor, is it fair to say then that if you

(6) were able to see Mr. Casale's and Mrs. Casale's

(7) medical records, that might have an effect on your

(8) opinions as expressed in your affidavits about what

(9) caused their physical ailments?

(10) A. Perhaps on - at least on some of the

(11) parameters, like, say, high cholesterol, for

(12) example - elevated cholesterol, for example.

(13) Q. So for at least some of the ailments that

(14) you've noted in your affidavit that you think were

(15) caused by the exposure, and maybe for more than some,

## NOTES

(16) If you saw their medical records that might affect  
 (17) your opinion?  
 (18) A. It might affect it, yes.  
 (19) Q. And let me ask you this. Do you know if  
 (20) either one of them, particularly during the period of  
 (21) exposure, was on any type of medications?  
 (22) A. Yeah, I have - I think I have information  
 (23) on that. Stella had some cortisone shots for her  
 (24) joint problems. Stella takes medicine, an  
 (25) antihypertensive. That's all I have.

## Page 50

(1) Q. Okay. And were those all the drugs that  
 (2) she - that she told you she had been taking or had  
 (3) been prescribed during the period she was being  
 (4) exposed?  
 (5) A. I believe so.  
 (6) Q. Were there any side effects from those drugs  
 (7) that you've just mentioned that you think may have  
 (8) been responsible for the ailments that she complained  
 (9) about?  
 (10) A. I have not - I have not reviewed them, so I  
 (11) mean, it is possible that they could have certain side  
 (12) effects and that would have to be ruled out.  
 (13) Q. Okay. And I understand. I'm not an expert  
 (14) in this, certainly, and it sounds like for the  
 (15) cortisone and the medicine and the antihypertensive  
 (16) you mentioned, you haven't done a review to see what  
 (17) the side effects of those drugs are?  
 (18) A. Well, of course, like the cortisone, I'm  
 (19) familiar with some of the side effects, but these were  
 (20) just shots.  
 (21) Medicine and whatever antihypertensive she's  
 (22) taking, I'd have to - I would have to review it in  
 (23) order to ensure that that was - that those were

(24) contributing.  
 (25) Q. Do you intend to do that prior to trial?

## Page 51

(1) A. Yeah, I would like to do that and see their  
 (2) previous medical records.  
 (3) Q. Right. Is there a chance that - and it  
 (4) sounds as though there's a chance that upon reviewing  
 (5) that, that might possibly affect your opinions. And  
 (6) what I mean is by reviewing what the effects of these  
 (7) drugs you've been taking are, that that might affect  
 (8) your opinion?  
 (9) A. There might be some impact on my opinion,  
 (10) yeah.  
 (11) Q. All right. Doctor, do you have any plans to  
 (12) make a revised report or revised affidavit?  
 (13) A. I'm not sure. If I'm asked to do so, I will,  
 (14) you know.  
 (15) Q. And all I'm going to ask you and your  
 (16) attorney is that if you do, that we be provided with  
 (17) a copy of that, because we may have to cover - if  
 (18) there's new things that come out on that, we may  
 (19) have to, you know, depose you if there's changes or  
 (20) whatever in your opinion.  
 (21) A. Of course.  
 (22) Q. You understand?  
 (23) Okay. Let me come back and ask you, you've  
 (24) said that as far as ruling out other causes, you look  
 (25) at frequency of occurrence, you look at previous

## Page 52

(1) medical records, and you look at the life-style of  
 (2) the people involved. Is there anything else that  
 (3) you haven't mentioned that you would use to determine  
 (4) whether a chemical is the cause of illness or that  
 (5) there's another cause?  
 (6) A. I did mention the genetic/familial  
 (7) questions. I think that's pretty much

it. I think

(8) if I had a precise list of medications and doses, et

(9) cetera, I could, you know, look into whether there

(10) was any problem - could be any problem from the

(11) medication.

(12) Q. Certainly. And that would be part of the

(13) medical records, I take it.

(14) A. Yes.

(15) Q. Okay. So anything else other than the

(16) genetic/familial background, medical records,

(17) frequency of occurrence and life-style that you would

(18) look at to rule out other causes, other than chemical

(19) exposure?

(20) A. No, I don't think so.

(21) Q. Doctor, would you agree with me that before

(22) any reasonable medical or scientific probability can

(23) be expressed relating to a chemical exposure in an

(24) observed illness in a specific person, exposure to

(25) that chemical agent has to be documented?

Page 53

(1) A. Yes.

(2) Q. Would you also agree that before any

(3) reasonable medical or scientific probability can be

(4) again expressed relating to a chemical exposure in an

(5) observed illness in a specific person, the level of

(6) exposure or the dose has to be documented at a level

(7) capable of inducing that illness?

(8) A. Okay. Regarding your last point, if I may

(9) comment on that, -

(10) Q. Sure.

(11) A. - often we don't have enough information

(12) to know the level of exposure. And, secondly,

(13) because the susceptibility of individuals differs

(14) substantially from individual to individual, there -

(15) it's very hard to predict what level on a given

# NOTES

(16) individual would be necessary to cause problems, what

(17) level and/or time.

(18) Some people would be extremely sensitive to

(19) it. Others might be resistant to it. So, for

(20) example, if you were - if, say, a group of ten people

(21) were exposed to a particular agent for several days,

(22) some of them might come down with severe problems and

(23) others with none at all. And, anyway, I just wanted

(24) to - I agree with what you say, but -

(25) Q. Okay. And that's kind of what I want to get

Page 54

(1) at, because - and the reason I'm saying that is that

(2) I want to understand if you would agree with that

(3) scientific principle with a qualification on it or if

(4) you wouldn't agree with it and, you know, you have

(5) reasons for not agreeing with it. Do you see what I'm

(6) saying? And what I'm getting at is whether, before

(7) you can have a reasonable or medical scientific

(8) probability relating to a chemical exposure in an

(9) observed illness in a person, that the level of

(10) exposure, the dose, has to be documented at a level

(11) capable of inducing that particular illness?

(12) A. Okay. I essentially agree with you, but let

(13) me point -

(14) Q. But it sounds like you would qualify it.

(15) You agree with the principle with a qualification?

(16) A. I would qualify it, because, for example,

(17) sometimes all one can get is some documentation. If

(18) in a particular case - let's say you're walking down

(19) the street and you smell something like rotten eggs

(20) and there's some kind of a chemical plant nearby, it's

(21) a reasonable assumption that that -

that that  
 (22) chemical is hydrogen sulfide and it's coming from that  
 (23) chemical plant. And you can also make an assumption  
 (24) that the concentration of that hydrogen sulfide is  
 (25) below the olfactory - is above the olfactory

Page 55

(1) threshold; in other words, the concentration in the  
 (2) air that an individual needs in order to smell it.  
 (3) So, in other words, you have - you've got at least  
 (4) a rough guideline of what the actual exposure is,  
 (5) that it's above a certain amount.  
 (6) So if you smell anything, then you've had  
 (7) exposure to it. If it's a volatile compound, then  
 (8) you've been exposed. The exposure may be slight, but  
 (9) in some cases it may be enough to be toxic.

(10) Q. Okay. And I want to see if you can help me  
 (11) out here, because I know if you - and you're giving  
 (12) it to me by way of example, but if you were going -  
 (13) let's say I was in your class and you were going to  
 (14) teach me what your qualification - to put in the  
 (15) simplest terms possible, what your qualification on  
 (16) that principle we just talked about would be, what  
 (17) would the qualification be stated as?  
 (18) A. Oh, the qualifications are that we are  
 (19) limited in terms of getting documentation about  
 (20) exposures, No. 1, and, therefore, sometimes the  
 (21) best we can do is establishing that an exposure  
 (22) took place by either symptoms following the  
 (23) exposure or smelling the exposure or tasting it,  
 (24) something like that, and if an exposure is - or  
 (25) if a chemical is smelled or tasted, then that

Page 56

# NOTES

(1) itself indicates that an exposure occurred, and the  
 (2) level of exposure can at least be guessed at on the  
 (3) basis of what the olfactory threshold is or the taste  
 (4) threshold if you have that information.  
 (5) Q. And if I'm understanding you, I think what  
 (6) you're telling me is that even if you don't know the  
 (7) exact level of exposure or the exact dose or the dose  
 (8) of the exposure that a person has experienced, you  
 (9) still think that you may be able to establish to a  
 (10) reasonable medical or scientific probability that a  
 (11) chemical exposure is related to an observed illness  
 (12) in a person?  
 (13) A. Yeah. I mean, well, first of all, obviously,  
 (14) you have to have the exposure. So if you're 20 miles  
 (15) away from it, from where some accident happened, it's  
 (16) not likely that you had much of an exposure. But if  
 (17) you're in the vicinity and you smell this particular  
 (18) compound and you've had - then you've had an  
 (19) exposure.  
 (20) If the exposure occurred for a reasonable -  
 (21) a definite amount of time and was recurrent, and if  
 (22) the literature indicated that exposure to compound X  
 (23) causes this disease, then that makes it more likely  
 (24) that there is a linkage between the exposure occurring  
 (25) and the particular disease.

Page 57

(1) Q. Well, let me ask you this, Doctor. If the  
 (2) literature indicates that a person being exposed to  
 (3) compound X may cause an illness, would the literature  
 (4) also establish that the person needs to be exposed to  
 (5) a certain level or a certain dose of compound X in  
 (6) order to, to a reasonable medical probability, have a

(7) causation relationship between that and the illness?

(8) A. Sometimes that is not available. Sometimes

(9) there's been enough work so that the so-called

(10) threshold for exposure is known. In other words,

(11) like - we're not talking about cancer but some

(12) noncancerous substance. If - below that particular

(13) concentration there's no effect, and above it there

(14) tends to be an effect.

(15) Now, you could - you know, it would vary

(16) somewhat from person to person, but it would be -

(17) you know, because of their susceptibility, but you

(18) could say that it would be around such and such, and

(19) you might be able to get it - you know, guess at it,

(20) say, within several orders of magnitude, but it's very

(21) difficult to get a precise level at which a particular

(22) person is going to be affected.

(23) Q. So you do the best you can to get a

(24) reasonable medical and scientific probability, -

(25) A. Right.

#### Page 58

(1) Q. - and it sounds like what you said is that

(2) for certain chemicals the literature has established a

(3) certain dose rate that typically will be associated

(4) with causing an illness and that below that dose rate

(5) it won't be associated with causing an illness,

(6) correct?

(7) A. On some compounds, yes, right.

(8) Q. And on some compounds you're saying that

(9) information just isn't available?

(10) A. Exactly.

(11) Q. So it sounds like - and I know we've been

(12) going around on this, but I want to make sure I

(13) understand what your opinion is.

(14) A. Yeah.

(15) Q. It sounds like you essentially

#### NOTES

agree with

(16) that principle, and what I mean by that is the

(17) principle that in order to have that reasonable

(18) medical or scientific probability, that there's a

(19) causative relationship between an exposure and an

(20) illness, you have to have documented the appropriate

(21) level of or dose of exposure to a person, but that

(22) sometimes that information isn't available and that

(23) sometimes people have different susceptibilities?

(24) A. Correct.

(25) Q. And let me ask you, in cases where you don't

#### Page 59

(1) have that type of information, it isn't available

(2) for that compound or to deal with people's

(3) susceptibilities, how do you factor that into your

(4) analysis?

(5) A. Well, of course, it makes it more difficult,

(6) and I think you have to look at it reasonably. If

(7) the - you know, if, for example, there was no

(8) evidence of a person being exposed, in other words,

(9) there was no smelling of it, no tasting of it, no ill

(10) effects at all, and - let's say, and the time were -

(11) was very fleeting also, then it would - one might

(12) conclude that the exposure was not likely - would

(13) not likely cause a disease or symptoms because the

(14) exposure was too low or too short.

(15) On the other hand, if it made the person

(16) sick, and the person smelled it and/or tasted it and

(17) it occurred for a significant length of time, then it

(18) makes it much more likely that that exposure then was

(19) responsible for those symptoms.

(20) Q. All right. And I take it you probably have

(21) to depend, to a significant degree, on

- what the people  
 (22) who are complaining about an illness  
 are telling you?  
 (23) A. Correct.  
 (24) Q. In other words, their truthfulness?  
 (25) A. Yes.

Page 60

- (1) Q. You know, for instance, the fact if  
 they're  
 (2) telling you, "I never had this problem  
 prior to this  
 (3) exposure," that's all you have to rely  
 on to know that  
 (4) or to factor into your analysis as to  
 whether it was  
 (5) caused by the exposure, the illness I  
 mean?  
 (6) A. That's right.  
 (7) Q. And if somebody says, "I smelled  
 rotten eggs  
 (8) or whatever and after that, the next  
 day, I started  
 (9) to have problems," you're relying on  
 that person to  
 (10) be truthful with you about what it is  
 they smelled or  
 (11) experienced in order to factor in your  
 analysis?  
 (12) A. Precisely.  
 (13) Q. And if somebody you're speaking  
 to or is  
 (14) giving you information is not being  
 truthful, that  
 (15) may have a significant impact on your  
 analysis. Is  
 (16) that fair to say?  
 (17) A. Significant impact on what?  
 (18) Q. On your analysis.  
 (19) A. Yes.  
 (20) Q. You see what I'm saying?  
 (21) A. If the person were not truthful,  
 then  
 (22) obviously you would - it would be a  
 false positive.  
 (23) Q. And if you later learned that what  
 they told  
 (24) you wasn't exactly accurate, it might  
 change your  
 (25) opinions?

Page 61

- (1) A. Right.  
 (2) MR. JORDAN: Okay. Doctor, would  
 you - by  
 (3) the way, you can take a break at any  
 time. I just  
 (4) want to let you know that.  
 (5) I don't know if you need to, because  
 I see  
 (6) you looking at your watch.

## NOTES

- (7) MR. FUERST: Well, I was just  
 thinking we're  
 (8) probably going to have to take a  
 lunch break.  
 (9) MR. JORDAN: Sure, I can do that  
 any time you  
 (10) guys want.  
 (11) MR. FUERST: Just whenever you  
 get to a  
 (12) place.  
 (13) MR. JORDAN: Yeah, I'll tell you what,  
 I  
 (14) think in about maybe ten minutes, 15.  
 What time you  
 (15) got?  
 (16) MR. FUERST: I've got about 10 till.  
 (17) MR. JORDAN: Okay. Let's just go a  
 little  
 (18) bit further. All right. Did you want to  
 go off the  
 (19) record for a second?  
 (20) MR. FUERST: Oh, no, no, go right  
 ahead.  
 (21) MR. JORDAN: All right. Great.  
 (22) Q. Doctor, and I'm asking you a lot of  
 (23) reasonable medical or scientific  
 probability  
 (24) questions, -  
 (25) A. Sure.

Page 62

- (1) Q. - but that's because I'm relying on  
 your  
 (2) expertise. And would you agree with  
 me also that  
 (3) before you - again, to any  
 reasonable medical or  
 (4) scientific probability can be  
 expressed relating a  
 (5) chemical exposure to an observed  
 illness in a specific  
 (6) individual, you have to have scientific  
 or medical  
 (7) evidence that the chemical in  
 question is capable of  
 (8) causing that illness in people?  
 (9) A. Yes.  
 (10) Q. Okay.  
 (11) A. Can I make one proviso?  
 (12) Q. Certainly.  
 (13) A. Sometimes there's no information  
 available on  
 (14) people, but there is on animals. In  
 other words, it  
 (15) causes that particular disease or  
 cluster of symptoms  
 (16) in animals, and it usually turns out  
 that when  
 (17) there's - when an exposure - an  
 animal exposure

- (18) produces a certain disease, it's likely that it  
 (19) happens in humans as well. But sometimes that  
 (20) information is just not available, so I - I'm not  
 (21) sure that that applies in this particular case, but  
 (22) I just wanted to - that's another proviso.  
 (23) Q. I see what you're saying.  
 (24) A. Yeah.  
 (25) Q. That sometimes -

## Page 63

- (1) A. You have to extrapolate.  
 (2) Q. - you're looking at a chemical in question  
 (3) that hasn't been tested or there's no test for humans  
 (4) yet, but you know it causes it in rabbits or something  
 (5) else?  
 (6) A. Right.  
 (7) Q. Does that have any - the fact that you don't  
 (8) have information on people, per se, only on animals,  
 (9) does that impact your analysis or make it less likely  
 (10) for any particular compound that you can make that  
 (11) relationship?  
 (12) A. Excuse me, I try to look first for - to see  
 (13) if there's human data, but if there's no human data  
 (14) and only animal data, then - and if the symptoms  
 (15) that the person is having are the same symptoms that  
 (16) the animal had in an exposure, then I feel that I'm  
 (17) justified in making an extrapolation; although, I  
 (18) mean, that extrapolation is - may be correct 95  
 (19) percent of the time and - you know, depending on the  
 (20) particular - on the particular case.  
 (21) Q. Okay. Are there any - let me ask you this,  
 (22) and this is partly my curiosity, and when you're  
 (23) dealing with just data on animals, what is the - is  
 (24) it completely random, or are there categories of  
 (25) animals that the medical literature shows are closest

## NOTES

## Page 64

- (1) to human with regard to the testing results? In other  
 (2) words, that if it's a rat that you've seen this in  
 (3) versus if they tested it on a monkey or something,  
 (4) it's less - it's less likely to have that  
 (5) correlation?  
 (6) A. Right. Well, of course, primates are  
 (7) closest to humans, and then other animals tend to  
 (8) be closest - close for particular organ systems.  
 (9) So, for example, a rabbit is a good model for  
 (10) studying dermal effects on people.  
 (11) Q. Okay.  
 (12) A. So they - like, you know, the drug companies  
 (13) use rabbit tests for irritation and things like that.  
 (14) If the particular effect occurs in a rodent,  
 (15) it's quite likely that it will occur in humans. If  
 (16) it occurs in two rodent species, it's almost a dead  
 (17) certainty.  
 (18) Q. I see. Okay.  
 (19) A. And if it occurs in three different species,  
 (20) you have absolutely no doubt.  
 (21) Q. Three different species of rodent?  
 (22) A. Yeah.  
 (23) Q. All right.  
 (24) A. But usually, even - if it occurs in mice or  
 (25) rats, it's likely to occur in humans, and if it occurs

## Page 65

- (1) in two rodent species, then it's close to, let's say,  
 (2) 99 percent, whatever. And there has actually been  
 (3) some studies on that, you know, on what the degree of  
 (4) accuracy and extrapolation is.  
 (5) Q. Right. What percentage?  
 (6) A. But it tends to be the more species you see  
 (7) it in, the more likely it will occur in humans.  
 (8) Q. Okay. So typically, if you can for a  
 (9) particular compound, you're going to want to test  
 (10) it on several different types of rodents?

- (11) A. Preferably, yes.  
 (12) Q. Let me ask you again, would you agree - and  
 (13) again, I'm using the same terms - that before you can  
 (14) have any reasonable, medical or scientific probability  
 (15) that can be expressed relating a chemical exposure in  
 (16) an observed illness in a person, there has to be a  
 (17) biologically plausible mechanism by which the chemical  
 (18) can cause the illness?  
 (19) A. Yes.  
 (20) Q. Okay. And last thing is would you agree  
 (21) that before you can have that reasonable medical or  
 (22) scientific probability that can be expressed relating  
 (23) a chemical exposure to an observed illness in a  
 (24) person, that - and we talked about this earlier -  
 (25) confounding variables, things like smoking, alcohol

## Page 66

- (1) use or effects caused by infectious diseases, let's  
 (2) say, have to be eliminated as potential causal or  
 (3) contributing factors?  
 (4) A. I agree in part with what you said, but  
 (5) the - at times there could be an interaction. So,  
 (6) for example, take the case of asbestos. Asbestos  
 (7) causes lung cancer. If - smoking also causes lung  
 (8) cancer. So if an individual is smoking and causes  
 (9) lung cancer, you can ask the question: Well, which  
 (10) caused it? The answer is they both caused it. So  
 (11) there's an interaction, where if you're smoking and  
 (12) exposed to asbestos, you're about roughly 50 times  
 (13) more likely to get lung cancer than if you were  
 (14) nonsmoking and not exposed to asbestos.  
 (15) So each has an effect, and then the combined  
 (16) effect is multiplicative. So it's synergism.

## NOTES

- (17) Q. Yeah, it sounds as they though you agree in  
 (18) part to the extent that if there are other confounding  
 (19) variables like smoking, they may, at a minimum, be a  
 (20) contributing cause, they may be the sole cause, or  
 (21) there may be an interaction going on?  
 (22) A. Correct.  
 (23) Q. Okay. Can you tell the jury what the term  
 (24) dose response means?  
 (25) A. Dose response means that, in general, as you

## Page 67

- (1) increase the dose or concentration of a substance that  
 (2) one is exposed to, the effect or response is going to  
 (3) increase. And you get essentially a sigmoidal type of  
 (4) response, like an S-shaped curve, where it's a low  
 (5) effect at - a small effect at low concentrations, and  
 (6) then you get a very rapid increase as you increase  
 (7) still further, and then it levels off again at higher  
 (8) concentrations. So that's essentially dose-response  
 (9) curve. But in general then as you increase the dose  
 (10) of a particular toxic substance, the response is going  
 (11) to increase.  
 (12) Q. Okay. So generally the higher the dose, the  
 (13) higher the response; is that fair?  
 (14) A. Yes, generally, yes.  
 (15) Q. And, generally, the lower the dose of a  
 (16) chemical, the lower the response?  
 (17) A. Yes.  
 (18) Q. Am I also correct in saying that  
 (19) extrapolations from dose-response curves is the  
 (20) method used to determine what dose of a drug or  
 (21) chemical would not produce some toxic effect?  
 (22) A. Right, within the limitations of doing that,  
 (23) because sometimes it's very difficult to go down to  
 (24) really observe an effect at very low concentrations,

(25) because you have to work with either a large number

## Page 68

- (1) of animal species or - a number of animals or a
- (2) large number of humans in order to observe anything
- (3) at a very low concentration. So sometimes you have
- (4) to work at higher concentrations and then extrapolate
- (5) down to lower ones.

(6) Q. Is it fair to say that with low concentrations or low doses it's tough to correlate

(8) a toxic effect?

(9) A. Yes.

(10) Q. Okay. Would you agree that a basic principle

(11) of toxicology is this dose-response relationship?

(12) A. Yes.

(13) Q. Okay. I take it you'd also agree that all

(14) substances can be considered to have toxic effects if

(15) the dose is sufficiently high?

(16) A. Well, most, in any event.

(17) Q. Okay. Let me ask you the reverse of that,

(18) which is basically would you agree that there are

(19) doses for most substances that may not be harmful?

(20) A. I would agree that many substances are not -

(21) don't - or have a certain dose range where they are

(22) not apparently toxic.

(23) Q. Okay. And that's what I'm getting at. I'm

(24) saying is it fair to say that for most substances that

(25) there are doses that are so low that they're not

## Page 69

(1) harmful?

(2) A. Yeah. The reason I qualified was because

(3) sometimes we're not aware of toxicity or we don't know

(4) how to measure it at very low doses.

(5) Q. Okay. And if we can't measure or know about

(6) the toxicity, it makes it pretty much impossible to

(7) correlate an effect on a person, doesn't it?

(8) A. It makes it difficult, yes.

## NOTES

(9) MR. JORDAN: I'll tell you what, I think this

(10) is as good a point as any, because I'm going to go

(11) into all the specific substances and everything.

(12) MR. FUERST: Okay.

(13) MR. JORDAN: So that may just be - and it's

(14) up to you guys. I mean, if you want to go on for a

(15) little bit longer, that's fine.

(16) MR. FUERST: I think this is as good a

(17) breaking point as any.

(18) [Lunch recess]

(19) MR. JORDAN:

(20) Q. Doctor, are you ready to move forward?

(21) A. I am ready.

(22) Q. Okay. I'll tell you what, the next area I

(23) wanted to go into with you is to focus specifically

(24) on the substances that formed the basis of the

(25) exposures in your analysis that caused Mr. and

## Page 70

(1) Mrs. Casale's ailments. And what I'd like to do

(2) as a preliminary matter is try and tie down all the

(3) different substances and chemicals that you feel

(4) like are involved. Okay?

(5) A. Yes.

(6) Q. Going off of your report, I know that you're

(7) saying - first thing you mentioned is dust composed

(8) of silica, so that's one substance that you feel like

(9) has a -

(10) A. Yes.

(11) Q. And then you have metal and organic

(12) compounds, and what I want to get at there is I need

(13) to find out from you exactly what compounds you're

(14) talking about.

(15) A. Right.

(16) Q. And I was hoping you could tell me that.

(17) When you say metal and organic compounds, what I'm

(18) getting at is what specific substances?

(19) A. Okay. The metals would be formed - would  
 (20) be aerosolized in the sandblasting operation, and  
 (21) so they would come from the - from the blasting  
 (22) operation, sandblasting operation.  
 (23) Q. Okay. And I know when you say "organic  
 (24) compounds," that means carbon-based, right?  
 (25) A. Yeah, and there I'm talking about what is

Page 71

(1) listed in that table that I stapled over here.  
 (2) Q. On Exhibit 3?  
 (3) A. Yes.  
 (4) Q. Okay. And I guess what I want to see is if  
 (5) you can tell me the specific compounds that you're  
 (6) talking about, even if it's by looking at -  
 (7) A. Yes.  
 (8) Q. Okay.  
 (9) A. Well, I need a little time to do that.  
 (10) Q. Yes, sir, and that's what I want to do.  
 (11) Doctor, because you can see this is very important  
 (12) for my client to know exactly what compounds you mean  
 (13) when you say metal and organic compounds.  
 (14) A. Yes, okay.  
 (15) Q. So you can take your time if you want to and  
 (16) look through that or whatever you need to.  
 (17) A. Fine. Now, the metals, as I say, they're not  
 (18) listed here.  
 (19) Q. Okay.  
 (20) A. They're what's - I mean, they're what the  
 (21) tank was or whatever was being sandblasted was  
 (22) composed of.  
 (23) Q. And maybe I'm asking you something you can't  
 (24) answer me.  
 (25) A. Yeah.

Page 72

(1) Q. Can you just not be any more specific than  
 (2) that? You can't tell me any more specific than just  
 (3) to say metal compounds or metal?

# NOTES

(4) A. I can't. I don't know what - I mean, if it  
 (5) was composed of galvanized tin, then, you know, that's  
 (6) what it would be, or, you know, stainless steel. I  
 (7) don't know.  
 (8) Q. You don't know?  
 (9) A. I don't know.  
 (10) Q. So the best you can say there is that metal  
 (11) is the most defined you can get?  
 (12) A. Right.  
 (13) Q. Some type of metal?  
 (14) A. Right.  
 (15) Q. And then we have organic compounds.  
 (16) A. Yes.  
 (17) Q. And that you can tell me.  
 (18) A. Yes, I can be more specific there, right. I  
 (19) have a - I came up with a list of compounds that I  
 (20) have, and first - I mean, if you like, first I can  
 (21) give the whole list and then I can tell you what I  
 (22) know, if anything, about those compounds causing the  
 (23) diseases.  
 (24) Q. And you know what, and that's what we're  
 (25) going to walk through all the other ones, and there

Page 73

(1) may be some overlap on some of the ones you've  
 (2) specifically mentioned.  
 (3) A. Yeah.  
 (4) Q. But that's what I'll do, is once you've given  
 (5) me the whole list, then I want to walk through the  
 (6) whole list.  
 (7) A. Yeah, I've got the list here. I'm sorry it's  
 (8) not typed up.  
 (9) Q. I think we may still need to get a copy of  
 (10) that, too, don't we?  
 (11) A. Yeah, right. In fact, I have the other notes  
 (12) that you didn't ask for.  
 (13) Q. Maybe what we can do is once we get the list,  
 (14) if you don't need that in front of you, we can get  
 (15) that copy made, so I'll be able to ask you about

- (16) that.  
 (17) A. Fine, fine.  
 (18) MR. FUERST: I forgot to have them do that  
 (19) over lunch.  
 (20) MR. JORDAN: That's okay.  
 (21) Q. If we can go through it, and if you don't  
 (22) need it in front of you, we can just have it made  
 (23) while we're talking.  
 (24) MR. FUERST: Okay.  
 (25) A. Yeah, that's fine. I will need it to discuss

Page 74

- (1) it, but -  
 (2) MR. JORDAN:  
 (3) Q. Sure. All right. You just handed me some  
 (4) sheets of paper that looks like your list.  
 (5) A. Yes.  
 (6) Q. Are these - and we may just go ahead and  
 (7) attach that as an exhibit at some point, but the  
 (8) three pages you've just handed me, is that all of  
 (9) the organic compounds we're talking about?  
 (10) A. Yes.  
 (11) Q. Okay.  
 (12) A. All the ones I'm aware of. I heard that  
 (13) there might be some others, but I haven't seen that  
 (14) information.  
 (15) Q. And, Doctor, just so we're both on the same  
 (16) sheet of music here, what's going to be marked as  
 (17) Exhibit 4 is three pages that cover all of the organic  
 (18) compounds that you're talking about that were involved  
 (19) in the exposure.  
 (20) A. Correct.  
 (21) Q. Is that correct?  
 (22) A. Yes.  
 (23) Q. Okay. And if we made both need to - it  
 (24) looks to me just from looking at it that there is some  
 (25) overlap between this and the list that you then cite

Page 75

- (1) to afterwards.  
 (2) A. Yes.  
 (3) Q. All right. We've tied that down

## NOTES

- anyway.  
 (4) The next thing you say is noxious odors caused by and  
 (5) including the carcinogens benzene and styrene and  
 (6) numerous other chemical compounds including caustic  
 (7) soda, and then you go through a list. Let me ask you  
 (8) this specifically. Are there any - what specific  
 (9) carcinogens can you tell me about that are in this  
 (10) exposure?  
 (11) A. Benzene and styrene is a suspect carcinogen.  
 (12) I need -  
 (13) Q. I'm sorry, go ahead.  
 (14) A. Styrene is a suspect carcinogen, chloroform  
 (15) and -  
 (16) Q. Well, let me ask you - this may make it  
 (17) actually simpler.  
 (18) A. Yeah.  
 (19) Q. And what I'm trying to find out is when you  
 (20) say - are all of the carcinogens that you're talking  
 (21) about in this exposure contained in Exhibit 4?  
 (22) A. Yes.  
 (23) Q. Is it fair to say then that Exhibit 4 covers  
 (24) every type of organic compound or any type of chemical  
 (25) that would have been involved in this exposure and

Page 76

- (1) these ailments to Mr. and Mrs. Casale?  
 (2) A. Correct.  
 (3) Q. So if we want to know every single thing that  
 (4) Hercules emitted that you believe caused ailments to  
 (5) these people, that's all in Exhibit 4?  
 (6) A. Yes, with the proviso that if that list was  
 (7) not complete that I saw and there are others, then I  
 (8) haven't - you know, I haven't reviewed those.  
 (9) Q. And again, to qualify, based on the  
 (10) information you have to date, Exhibit 4 contains every  
 (11) type of chemical or other substance you believe caused

- (12) illnesses to Mr. and Mrs. Casale?  
 (13) A. Correct.  
 (14) MR. JORDAN: All right. Well, that makes  
 (15) things easier. We'll be able to just use exhibit -  
 (16) why don't we take a quick break and make a copy of  
 (17) Exhibit 4.  
 (18) [Discussion off the record]  
 (19) [Exhibit 4 marked, Dr. Trief's handwritten  
 (20) list of chemicals and organic compounds]  
 (21) MR. JORDAN:  
 (22) Q. Doctor, let's start with the first substance  
 (23) we're talking about, which is the dust composed of  
 (24) silica.  
 (25) A. Yes.

## Page 77

- (1) Q. How did you determine that that substance  
 (2) first of all was being admitted by the Hercules  
 (3) facility?  
 (4) A. That's based on the fact that there is  
 (5) sandblasting, so if - assuming there is - that that  
 (6) is a correct statement, that there is sandblasting,  
 (7) then you have - it's done with silica.  
 (8) Q. And I guess what I'm saying is during the  
 (9) period that they say they were exposed, your basis  
 (10) for determining that there was sandblasting while  
 (11) they were exposed is based on what they've told you  
 (12) or documents you've seen from Hercules or -  
 (13) A. Based on what they've told me.  
 (14) Q. Based on what they told you?  
 (15) A. Yeah.  
 (16) Q. And that alone?  
 (17) A. Right, I didn't see any documents related to  
 (18) sandblasting.  
 (19) Q. So based on what the Casales told you?  
 (20) A. Right.  
 (21) MR. FUERST: Well, you need to be a little  
 (22) more specific about that, I think, Dr. Trief, about  
 (23) you saw the videotape, too, didn't

## NOTES

- you?  
 (24) THE WITNESS: Well, yeah, I mentioned the  
 (25) video. Yeah, yeah, and the video, yeah.

## Page 78

- (1) MR. JORDAN:  
 (2) Q. Did you see sandblasting on the videotape or  
 (3) not?  
 (4) A. Yeah, I could see a plume from the  
 (5) sandblasting, yeah.  
 (6) Q. Okay. So you saw sandblasting on the  
 (7) videotape?  
 (8) A. Yeah.  
 (9) Q. Okay. How did you determine that this dust  
 (10) composed of silica was actually causing harm to these  
 (11) people?  
 (12) A. Because it does harm to sandblasters, and  
 (13) they have to wear protective equipment, breathing  
 (14) apparatus and so on, so that it's - the Casales  
 (15) were not wearing any. Now, granted that they were  
 (16) further away than a blaster would be from the silica;  
 (17) nevertheless, it would - there would be some silica  
 (18) in the air, and it would - so it would have an  
 (19) adverse health effect.  
 (20) Q. Let me ask you how you can be sure there  
 (21) would be silica in the air at the distance they  
 (22) were at from where the sandblasting was taking  
 (23) place?  
 (24) A. Well, it has to be, I mean, from the  
 (25) operation. I mean, it's just a fact. It's a fact

## Page 79

- (1) of life where, I mean, if it's used in the operation,  
 (2) then it's going to be in the air. It will just be  
 (3) diluted or reduced in concentration as you move away  
 (4) from the -  
 (5) Q. Okay.  
 (6) A. I mean, it will never go down to zero. It's  
 (7) just a question - as to what the

actual concentration

(8) is, I can't - I can't say, but it's going - you

(9) know, it will be there.

(10) Q. And that's kind of what I'm getting at. You

(11) see what I'm saying -

(12) A. Right.

(13) Q. - is I'm trying to tie down presumably there

(14) has to be some sort of objective evidence, some parts

(15) per billion in the air or something like that where

(16) they were at from the sandblasting that would

(17) establish -

(18) A. As far as I know, there was no monitoring.

(19) I mean, I don't know of any monitoring that was done

(20) to establish whether there was -

(21) Q. Is there any literature that you relied

(22) upon with regard specifically to, you know, this

(23) dust composed of silica, any literature indicating

(24) what level of exposure would harm somebody?

(25) A. Not directly, no, but, I mean, it's - you

#### Page 80

(1) know, it's known that there are occupational standards

(2) for use of silica.

(3) Q. Okay. And just so - and just so you

(4) understand where I'm going to, I want to see it, I

(5) want to find out if there's any treatise or book or

(6) study or anything that you looked at or relied upon

(7) in saying, you know, this amount of silica in the

(8) air where they were at would cause harm to them.

(9) Is there any document that you can point me to that

(10) would -

(11) A. No, I can't.

(12) MR. FUERST: I think that's where the problem is with the question, is that I think what

(14) he's telling you is that he didn't look at any

(15) documents or any treatises or anything to determine

#### NOTES

(16) that, because he pretty much already knew that as a

(17) fact. If your question is what are the documents or

(18) the treatises or whatever that support that, I think

(19) that's a different question.

(20) MR. JORDAN: Sure. And again - and that's a

(21) point well made.

(22) Q. I can break it down into two parts. If

(23) you're basing it just on your experience, and in

(24) dealing with this particular case you didn't look at

(25) any particular treatise, then maybe the way to ask it

#### Page 81

(1) to you is what documents you know of, based on your

(2) experience, that support - you see what I'm saying -

(3) that support your conclusion?

(4) A. I would look at some EPA documents on

(5) community or ambient standards for silica, and I

(6) haven't done so.

(7) Q. Okay.

(8) A. But that's what I would do.

(9) Q. Yeah, and I understand we're breaking this

(10) down into two things. For this particular case you

(11) didn't review any particular documents concerning

(12) dust composed of silica and what levels of exposure

(13) are needed to cause somebody an ailment; you were

(14) basing it on your experience?

(15) A. Right.

(16) Q. Okay.

(17) A. Now, the silica is not going to be causing

(18) any neurological problems, but it would be causing

(19) some - it could be causing respiratory problems.

(20) Q. Okay. Why don't we hit that briefly?

(21) A. Yeah.

(22) Q. What specific types of problems do you think

(23) the silica was causing the Casales?

(24) A. Respiratory problems.

(25) Q. Okay. Just respiratory?

#### Page 82

## NOTES

(1) A. Yeah.  
 (2) Q. Okay. And as your attorney just mentioned,  
 (3) are there documents - I'm not saying documents  
 (4) reviewed for this case, but what documents - can you  
 (5) tell us of any documents, treatises, books that you  
 (6) can cite to that are out there that support your  
 (7) conclusion that the silica they were exposed to caused  
 (8) them harm? And what I mean by that is having to do  
 (9) with levels of silica that can cause harm to people  
 (10) at the distances they were at or in that vicinity.  
 (11) A. I would say that a likely document would be  
 (12) an EPA document on criteria - on ambient air criteria  
 (13) for silica.  
 (14) Q. Okay. Is that a specific EPA document or a  
 (15) series of documents that -  
 (16) A. Yeah, it's one of many documents on - you  
 (17) know, they have documents for different compounds or  
 (18) groups of compounds, so -  
 (19) Q. And is that - to test your memory here, but  
 (20) is that the exact name of the document?  
 (21) A. I'm not sure. I'm not sure. But most of  
 (22) them said criteria for air pollution standard or  
 (23) ambient air pollution standard for such and such a  
 (24) compound or water standard.  
 (25) Q. Okay. Do you have copies, by any chance, of

## Page 83

(1) those documents?  
 (2) A. I've got - I have some. I could - but  
 (3) not - I don't believe I have a silica - you know,  
 (4) one on silica, but, you know, I could obtain it.  
 (5) Q. Okay. I mean, if you can, you can get that  
 (6) to us, -  
 (7) A. Yeah.  
 (8) Q. - that would be great. But it's ambient air

(9) pollution specifically with regard to silica, and you  
 (10) have a memory that there are ones put out by the EPA  
 (11) specifically with regard to silica?  
 (12) A. Yes.  
 (13) Q. Okay. Any over documents that you know of  
 (14) that would support -  
 (15) A. EPA - I'm sorry, ATSDR, Agency for Toxic  
 (16) Substance and Disease Registry, does documents called  
 (17) toxicity profiles on different compounds, and they may  
 (18) well have done one on silica, but I'm not certain of  
 (19) that.  
 (20) Q. So you don't know for a fact if there's an  
 (21) ATSDR document?  
 (22) A. I don't know for a fact.  
 (23) Q. So that document may or may not exist?  
 (24) A. And, similarly, NIOSH may have done an  
 (25) occupational health criteria.

## Page 84

(1) Q. And NIOSH is?  
 (2) A. National Institute of Occupational Safety and  
 (3) Health.  
 (4) Q. Okay. Again, is that like the ATSDR, you  
 (5) don't know for a fact -  
 (6) A. Yeah, I'm not exactly sure, but it would be  
 (7) likely that they have.  
 (8) Q. Well, can you tell us if ATSDR and NIOSH did  
 (9) put out something, they're things that you would have  
 (10) read in the past or you think?  
 (11) A. Well, I might have.  
 (12) Q. Okay.  
 (13) A. But I can obtain them, I think.  
 (14) Q. Okay.  
 (15) A. And, you know, be happy to try to get them.  
 (16) Q. That would be - that would be super.  
 (17) A. Yeah.  
 (18) Q. Any other documents or books or treatises or  
 (19) anything?  
 (20) A. Some occupational medicine books, but I -  
 (21) well, I'm not sure of others, but anyway -

- (22) Q. Yeah, I mean, if you can't remember -  
 (23) A. I would say an occupational medicine book. I  
 (24) think it's - I think Lenz is the author, L-e-n-z, I  
 (25) believe.

Page 85

- (1) Q. And that deals with silica?  
 (2) A. No, just occupational medicine in general and  
 (3) silica probably would be one of the toxic substances,  
 (4) kind of a classical toxic substance.  
 (5) Q. But you're not sure whether or not that one  
 (6) would be applicable?  
 (7) A. Well, it probably would be talking about  
 (8) occupation and not -  
 (9) Q. That's like a sandblaster -  
 (10) A. Right.  
 (11) Q. - as opposed to people -  
 (12) A. Right, sandblaster or miner.  
 (13) Q. And so you know, what I'm going to be doing  
 (14) is for each one of these I'm going to be asking you if  
 (15) you can think of the specific - there may be several  
 (16) of the same books for different substances, but to  
 (17) the extent you can tell me, you know, what specific  
 (18) texts you're relying on, it's going to be important  
 (19) for us to know where that information is. Do you see  
 (20) what I'm saying?  
 (21) A. Yes.  
 (22) Q. So if there's anything else on the silica -  
 (23) is there anything else on that, any other texts?  
 (24) A. I'm sure there are, but, you know, I would  
 (25) say that more or less covers it.

Page 86

- (1) Q. Okay. So to your - to the best of your  
 (2) knowledge, that covers it?  
 (3) A. Yes.  
 (4) Q. Okay. Do you know how long the silica had  
 (5) been - this dust composed of silica had been emitted  
 (6) in the vicinity of the Casales' home?  
 (7) A. Whenever they did sandblasting operations, so

# NOTES

- (8) I don't know -  
 (9) Q. In other words, do you have a specific  
 (10) knowledge of how many months or how many years?  
 (11) A. No, I don't.  
 (12) Q. You don't one way or the other?  
 (13) A. I just know that the whole process - I mean,  
 (14) this is - I guess we're talking about something like  
 (15) an eight- or nine-year period, so starting in 1989 and  
 (16) going till about '96 or '97, so -  
 (17) Q. Okay.  
 (18) A. We've got - yeah, I've got information just  
 (19) '94 through -  
 (20) MR. FUERST: Well, that's for the chemicals.  
 (21) THE WITNESS: Yeah.  
 (22) MR. JORDAN:  
 (23) Q. We're going to get to all those. I'm talking  
 (24) purely about the sandblasting, this dust composed of  
 (25) silica.

Page 87

- (1) A. Yeah.  
 (2) Q. And it's okay. I mean, if you just don't  
 (3) know one way or the other how long it was being  
 (4) emitted, that's fine. If you do know -  
 (5) A. In Stella Casale's affidavit it goes back to  
 (6) '89 and through - through '96, so it's about seven  
 (7) years, nearly seven years.  
 (8) Q. Okay. So according to Ms. Casale, it was  
 (9) going on between 1989 and 1996?  
 (10) A. Yes.  
 (11) Q. Do you know whether it was going on  
 (12) continuously during those years? Is that your  
 (13) understanding? Or was it periodic?  
 (14) A. I would say, you know, from what I've seen,  
 (15) it was probably intermittent.  
 (16) Q. Okay. And when you say "intermittent," you  
 (17) may not be able - can you be any more specific than  
 (18) that?  
 (19) A. No, I can't be.  
 (20) Q. Okay. Do you have any idea of what

- (21) concentration, what kind of concentrations of this  
 (22) silica in the air was being emitted?  
 (23) A. No, I don't.  
 (24) Q. Okay.  
 (25) A. No.

Page 88

- (1) Q. So I would take it you don't have any idea  
 (2) what kind of concentration of this silica substance  
 (3) was in the vicinity of their residence during that  
 (4) time?  
 (5) A. I don't know precisely, no. No, I could  
 (6) make an estimate, you know. If I knew just what the  
 (7) concentration was at the source, I could determine it.  
 (8) Q. Okay. And I think you've already answered  
 (9) this. What types of health effects are this silica  
 (10) normally associated with in humans, just respiratory  
 (11) problems?  
 (12) A. Respiratory problems, yes.  
 (13) Q. Do you know any more specifically than that  
 (14) what types of respiratory problems or just generally  
 (15) respiratory problems?  
 (16) A. Well, it causes - at least in occupational  
 (17) levels it will cause something called silicosis, which  
 (18) is a pneumoconiosis. It's an occupational lung  
 (19) disorder, and so that you may get - in other words,  
 (20) there would be some - there would be respiratory  
 (21) irritation as a result.  
 (22) Q. Okay.  
 (23) A. With some - possibly some allergic reaction  
 (24) to the silica.  
 (25) Q. Okay. At what - you can tell me this if

Page 89

- (1) you know. At what exposure level to this silica would  
 (2) somebody have these effects, respiratory problems?  
 (3) And what I'm looking for is, if you can tell me, in,  
 (4) for instance, silica as far as milligrams per cubic

# NOTES

- (5) meter of air or parts per million or billion of air.  
 (6) A. Well, I would have to look at the threshold  
 (7) limit value, and that - that, in itself, you know,  
 (8) would not mean that - even if it was below the  
 (9) threshold limit value, it wouldn't mean that the  
 (10) person was unaffected by it. Do you follow me?  
 (11) What I'm saying is -  
 (12) Q. And maybe what I'm asking you is -  
 (13) A. You're asking a complicated question,  
 (14) because -  
 (15) Q. Maybe the way to begin it is to say are you  
 (16) aware that there is a threshold level associated with  
 (17) these type of effects, like, you know, there needs to  
 (18) be this part per million in the air that person is  
 (19) breathing or in this cubic meter - do you see what  
 (20) I'm saying?  
 (21) A. Yes.  
 (22) Q. Are there those types of threshold levels for  
 (23) the effects with regard to silica?  
 (24) A. Well, the answer is yes, there is. Yes,  
 (25) there is, of course, a - well, I have some material

Page 90

- (1) in this book of mine on it, this.  
 (2) Q. Okay. And your book is again Environment -  
 (3) A. Environment and Health. Yeah, it's on here.  
 (4) Q. This is a book you wrote?  
 (5) A. Yeah.  
 (6) Q. And you're referring me to page 234?  
 (7) A. Yeah.  
 (8) Q. Well, I don't know how you - since you could  
 (9) probably identify the best portion better than me, why  
 (10) don't you tell us what that is?  
 (11) A. Well, this discusses the disease and  
 (12) indicates the agent - the disease is silicosis.  
 (13) The agent is finally divided silica either in a

- (14) crystalline or noncrystalline form, and the - it
- (15) says, "Rapidly developing silicosis, manufacturers
- (16) and packers of abrasive soap powders, sandblasters,
- (17) high-powered drillers of tunnel rock and chronic
- (18) silicosis from mining industries, potteries,
- (19) foundries, stone cutting and finishing, tile and
- (20) clay producing, glass manufacturing, and the
- (21) characteristics may be either rapidly developing,
- (22) eight to 18 months, or chronic with a latency period
- (23) of one to 20 years, and the particles of silica or
- (24) silicate from five-tenths to one micrometer are
- (25) responsible leading to a fibrogenic reaction in

## Page 91

- (1) alveolar tissue," et cetera, et cetera.
- (2) And it says, you know, the kind of silica or
- (3) silicate, air concentration, particle size, duration
- (4) of exposure, synergistic action, individual
- (5) susceptibility are all factors in the development of
- (6) the disease. And, as we mentioned before, the higher
- (7) the concentration, the more likely the disease would
- (8) occur. And so -
- (9) Q. Well, let me get - let me see - and your
- (10) book may answer this, but let me just see if you know
- (11) this or your book can tell us. Is there an exposure
- (12) level, let's say a minimum level, as far as, you know,
- (13) particles in the air of this substance that you can
- (14) say is a threshold where you may see effects from
- (15) silica?
- (16) A. Well, that's a - that's one of those tough
- (17) questions, because it may - it just may not be
- (18) known. Even though there's a standard, studies may
- (19) not have been done that will show

## NOTES

- exactly what -
- (20) whether that particular level would ensure safety.
- (21) Q. Well, okay. Why don't we approach it this
- (22) way then.
- (23) A. Yeah.
- (24) Q. Do you know of any studies or do you know of
- (25) any literature out there that tells you - that tells

## Page 92

- (1) anyone what the exposure level is for silica to have
- (2) respiratory problems?
- (3) A. Again, this is a - you know, it's a
- (4) question - the answer to this question depends on
- (5) who the individuals are, what other factors are
- (6) present, what kind of silica we're talking about, how
- (7) long they're working with the silica, under exactly
- (8) what conditions and so on. And so, you know, to give
- (9) you a single number is not very meaningful.
- (10) Q. And, actually, maybe what we can do is
- (11) combine it, because I was about to ask you how long
- (12) somebody would need to be exposed to it, and that may
- (13) be, you know, how long and the frequency. And I guess
- (14) what I'm getting at is I'm trying to find out if there
- (15) are - if there is literature that supports - you see
- (16) what I'm saying - supports the causation that you've
- (17) analyzed between silica and the respiratory problems
- (18) that the Casales have, if there is literature that
- (19) shows how long someone has to be exposed to have those
- (20) effects and what level of exposure there needs to be.
- (21) A. Yeah. Well, there have been a lot of studies
- (22) on toxicity of silica, and most of them have been
- (23) occupational, and for the reason that in occupations
- (24) the level of silica is high enough so that you get,
- (25) you know, a fair number of individuals

with the

Page 93

- (1) disease.
- (2) Now, when you lower the concentration
- (3) substantially further, you lower the number of people
- (4) that will come down with the disease, but it doesn't
- (5) mean that it's going to go down to zero. You may have
- (6) some people that are sensitive to the effects and may
- (7) develop some problems.
- (8) Q. But I take it you -
- (9) A. Does that answer your question?
- (10) Q. Well, I think, you know, we're getting
- (11) there. And I understand it's not an easy question
- (12) to answer.
- (13) A. Right.
- (14) Q. And I think what I need to ask you is
- (15) obviously you didn't look at any particular studies
- (16) or any particular literature when you were looking
- (17) into the Casale's case that would tell you the level
- (18) of exposure and the time needed for exposure to have
- (19) an effect of being exposed to silica?
- (20) A. No, I didn't.
- (21) Q. Okay. You were basing it on your
- (22) experience. And that's what I'm trying to get at.
- (23) And if there isn't anything you can cite us to, then
- (24) there isn't, but I just want to see if there is any
- (25) literature you can specifically cite us to that would

Page 94

- (1) tell us for silica what the level of exposure and the
- (2) time of exposure needed to be in order to have a
- (3) causative effect of respiratory problems.
- (4) A. Well, I think - I mean, I can give you some
- (5) references. Whether they'll precisely answer that
- (6) question that you're referring to, I - and I would
- (7) give you this reference here. It's No. 46,
- (8) Fitzgerald, et al, on environmental

NOTES

lung disease.

- (9) Q. This is No. 46 on page 253 of your book
- (10) Environment and Health?
- (11) A. Yeah, and also 47, Milby, pneumoconioses.
- (12) I mean, do you want to see -
- (13) Q. Yeah.
- (14) A. So 46 and 47 there.
- (15) Q. Why don't we go ahead and at some point
- (16) we'll make a copy - I'll just tag it for a moment,
- (17) and we'll make a copy of that. For the record,
- (18) it's referring to numbers 46 and 47 on page 253 of
- (19) Dr. Trief's book Environment and Health. And those
- (20) are two pieces of literature that you think would -
- (21) may refer to -
- (22) A. Yes, they may.
- (23) Q. Okay. And so you get at what I'm asking
- (24) is, you know, earlier we agreed that the dose-response
- (25) theory is important -

Page 95

- (1) A. Right.
- (2) Q. - in analyzing whether somebody's got an
- (3) effect caused by exposure to a particular substance?
- (4) A. Right.
- (5) Q. And that's why I'm asking you these questions
- (6) about silica.
- (7) A. Sure.
- (8) Q. Which is trying to tie down as best we can,
- (9) you know, what the level of exposure, and it sounds
- (10) like that's the best we can do.
- (11) A. Right.
- (12) Q. Is there any other - are there any other,
- (13) other than what we've mentioned here, these documents
- (14) 46 and 47 from page 253 of your book?
- (15) A. Well, perhaps the documentation for the TLV.
- (16) They have - the threshold limit values or TLVs have
- (17) documentation, and so that probably could be
- (18) consulted.
- (19) Q. Okay. But as you sit here today,

- you  
 (20) couldn't tell us -- you know, right here, as you sit  
 (21) here today, you couldn't tell us how long someone  
 (22) would need to be exposed --  
 (23) A. Correct.  
 (24) Q. -- or what level of exposure --  
 (25) A. That's correct.

## Page 96

- (1) Q. -- in order to have a respiratory effect from  
 (2) being exposed to silica?  
 (3) A. Correct.  
 (4) Q. And I think I know the answer to this  
 (5) question. In your opinion the route of exposure that  
 (6) the Casales had to silica was by breathing it, right?  
 (7) A. Yes.  
 (8) Q. It wasn't by drinking water or anything like  
 (9) that?  
 (10) A. No.  
 (11) Q. But I want to make sure I understand it is  
 (12) your opinion to a reasonable degree of medical and/or  
 (13) scientific certainty that the Casales were exposed to  
 (14) silicate -- dust composed of silica?  
 (15) A. Yes.  
 (16) Q. But you don't know what level of silica they  
 (17) were exposed to or how long they were exposed to  
 (18) silica?  
 (19) A. Correct.  
 (20) Q. Okay. And that may make it difficult for me  
 (21) to ask the next question, but I want to make sure I  
 (22) understand. You don't know how long they were exposed  
 (23) to silica or the level of exposure, but can you  
 (24) still -- is that correct?  
 (25) A. With regard to how long, as we mentioned, it

## Page 97

- (1) was like approximately from 1989 to 1996, so like  
 (2) seven years, but it was intermittent.  
 (3) Q. Okay. And you don't know the levels of  
 (4) exposure that they had?  
 (5) A. No.  
 (6) Q. All right. Would you characterize

## NOTES

their

- (7) exposure as acute or chronic?  
 (8) A. Chronic exposure.  
 (9) Q. Okay. Can you tell the jury what chronic  
 (10) exposure to a substance like silica is?  
 (11) A. Chronic means exposure over a long period of  
 (12) time. Usually, say, a period of six months or more is  
 (13) considered chronic.  
 (14) Q. Okay.  
 (15) A. One week would be or -- one week would be  
 (16) acute, and periods, say, between a week and six months  
 (17) would be semi-acute.  
 (18) Q. Okay. And I take it it's your opinion that  
 (19) the only ailments that the Casales suffer from as a  
 (20) result of that chronic exposure to silica is  
 (21) respiratory problems; is that correct?  
 (22) A. Yes.  
 (23) Q. Let me ask you this. How did you determine  
 (24) that those respiratory problems are a result of their  
 (25) exposure to silica, let's say, for example, as opposed

## Page 98

- (1) to something else, maybe even another chemical?  
 (2) A. Well, I don't think that their exposure is --  
 (3) I mean, that their respiratory problems are only due  
 (4) to silica, but they're due to exposure to all of the  
 (5) chemicals as well as the silica.  
 (6) Q. Okay. So --  
 (7) A. So it's a -- basically a composite, so their  
 (8) effects are due to the -- this multiple exposure to  
 (9) various chemicals, including silica.  
 (10) Q. Okay. And with regard to silica itself  
 (11) causing respiratory problems, your basis for that  
 (12) is --  
 (13) A. It's well established throughout all the  
 (14) occupational literature that it causes pneumoconiosis,  
 (15) and that's why they provide protective gear to  
 (16) sandblasters, miners, so on and --

## NOTES

(17) Q. Okay. And I think we've already gone through  
 (18) that. All right. All right. Let me ask you this.  
 (19) Give me a second here. I'm sorry.  
 (20) A. Sure.  
 (21) Q. All right. I'm going to ask you a couple of  
 (22) things. Were you aware that Mrs. Casale had been on  
 (23) the medication flurazepam? It's spelled  
 (24) F-l-u-r-a-z-e-p-a-m.  
 (25) A. That's a question?

Page 99

(1) Q. Yeah, are you aware that she had been on  
 (2) that?  
 (3) A. No.  
 (4) Q. Okay. Are you aware that one of the side  
 (5) effects of that drug is shortness of breath?  
 (6) A. No, I wasn't.  
 (7) Q. Okay. Could that be a type of respiratory  
 (8) problem that somebody would complain about similar  
 (9) to silica?  
 (10) A. Yeah, it could have - could contribute to  
 (11) it, yeah.  
 (12) Q. Okay. Were you aware that Mrs. Casale was  
 (13) also - had been on a medication called Hydrocet?  
 (14) A. Hydro what?  
 (15) Q. Hydrocet, H-y-d-r-o-c-e-t.  
 (16) A. For hypertension or what?  
 (17) Q. Apparently it was - it was an analgesic,  
 (18) and I only - my only indication is the treatment of  
 (19) moderate to severe pain. This is in 1994. So that's  
 (20) the best I can tell you.  
 (21) A. No, I wasn't.  
 (22) Q. Okay. Are you aware that a side effect of  
 (23) that drug is respiratory depression?  
 (24) A. No.  
 (25) Q. Is respiratory depression another respiratory

Page 100

(1) ailment?  
 (2) A. Well, it's a central - you know, it's a  
 (3) central nervous system effect, respiratory

(4) depression. It's not on the respiratory tract itself,  
 (5) but, I mean, it could manifest itself in difficulty in  
 (6) breathing, I guess. I don't know.  
 (7) Q. Okay. Would it be fair to say that if it's  
 (8) difficulty in breathing, it's some type of respiratory  
 (9) distress?  
 (10) A. Yeah, if it's, you know, significant enough.  
 (11) Q. Are you aware that Mrs. Casale was also -  
 (12) had also been on a medication called Lortab?  
 (13) A. Lortab?  
 (14) Q. It's another analgesic.  
 (15) A. I may have had it in my notes.  
 (16) MR. FUERST: They're right here.  
 (17) THE WITNESS: Yeah.  
 (18) A. Well, no, I don't - I don't know. I didn't  
 (19) know that, no.  
 (20) MR. JORDAN:  
 (21) Q. Okay. I don't know if you were - were you  
 (22) aware that a side effect of that drug was also  
 (23) respiratory depression?  
 (24) A. Ah, okay. Okay. Thank you. Yeah. Yeah.  
 (25) Q. Okay. I don't know if you were - and I'm

Page 101

(1) just asking you - and you can answer me quickly I  
 (2) wasn't aware of it - were you aware that Lortab may  
 (3) cause a side effect of respiratory depression?  
 (4) A. I wasn't aware of that, no.  
 (5) Q. Were you aware that she was also on a drug  
 (6) called Pilo - I'm sorry Pilosec, P-i-l-o-s-e-c?  
 (7) A. No.  
 (8) Q. All right. Were you aware that a side effect  
 (9) of Pilosec is upper respiratory infection?  
 (10) A. No, I was not aware of that.  
 (11) Q. Could that also be an explanation for her  
 (12) respiratory distress or ailment?  
 (13) A. Could contribute, yes.  
 (14) Q. Were you aware that she was also on a drug  
 (15) called Robitussin-DAC?

- (16) A. No.  
 (17) Q. Okay. I don't know if you know this, but  
 (18) are you aware that Robitussin-DAC causes shortness of  
 (19) breath?  
 (20) A. No.  
 (21) Q. Okay. She was also on a drug called Ru-Tuss.  
 (22) R-U-T-U-S-S. Did she tell you that?  
 (23) A. No.  
 (24) Q. Okay. Apparently some of the side effects of  
 (25) Ru-Tuss are dryness of mucous membranes, thickening of

Page 102

- (1) bronchial secretions, tightness of chest. Any of  
 (2) those sound like they could affect your respiratory  
 (3) condition?  
 (4) A. Probably, yes.  
 (5) Q. Okay. What about did you know she was on  
 (6) Tylenol 3?  
 (7) MR. FUERST: This one's in here, Ru-Tuss.  
 (8) A. No, I didn't.  
 (9) MR. JORDAN:  
 (10) Q. Okay. You may not be aware of this. Did you  
 (11) know that Tylenol 3 also causes shortness of breath?  
 (12) A. No, I didn't know that.  
 (13) Q. Okay. Lastly, did she ever tell you that she  
 (14) was on Vicodin?  
 (15) A. How do you spell that?  
 (16) Q. Vicodin is V-i-c-o-d-i-n.  
 (17) A. No.  
 (18) Q. Okay. She never - were you aware that  
 (19) Vicodin also - a side effect is respiratory  
 (20) depression?  
 (21) A. No.  
 (22) Q. Okay. Doctor, if you assume with me that at  
 (23) certain points Mrs. Casale was on all these different  
 (24) drugs, all of which have these respiratory side  
 (25) effects, isn't it possible that these are the actual

Page 103

- (1) cause of her respiratory problems?  
 (2) A. Well, they could contribute to it like  
 (3) other - you know, like chemicals as well. So, I

## NOTES

- (4) mean, it could - it could be a result of everything.  
 (5) Q. Well, you were saying -  
 (6) A. Yeah.  
 (7) Q. You said before that -  
 (8) A. Yeah.  
 (9) Q. You gave me a list of drugs that you knew she  
 (10) had told you she was on.  
 (11) A. Yes, yes.  
 (12) Q. And none of these were on that list. Does  
 (13) the fact that she was on these drugs have any affect  
 (14) on your opinion about cause of her respiratory  
 (15) problems?  
 (16) A. Well, I think those drugs could be adding  
 (17) to it, yes.  
 (18) Q. Is it possible they're the sole cause of  
 (19) her respiratory problems?  
 (20) A. Probably not, but because - I mean, the  
 (21) chemicals that she was exposed to cause respiratory  
 (22) problems, too, so I would say that if, in fact, those  
 (23) drugs had side effects that were respiratory in  
 (24) nature, that her respiratory problem was a composite  
 (25) of all of those things.

Page 104

- (1) Q. Well, if we presume that she had respiratory  
 (2) problems prior to the initiation of Hercules'  
 (3) activities, would that indicate anything to you about  
 (4) what the cause of her respiratory problems was?  
 (5) A. It would indicate that they - that at least  
 (6) to some degree they preceded Hercules' operation, yes.  
 (7) Q. Let me go ahead and let me go to the next -  
 (8) this is a - would you agree - let me ask you this.  
 (9) Would you agree with me that given the dose-response  
 (10) relationships we talked about before, that someone -  
 (11) that you should be able to determine what kind of dose  
 (12) of silica would be needed to cause an adverse effect

(13) in humans?

(14) A. As I mentioned before, the effect's going

(15) to differ from person to person, and so it's really

(16) quite hard to predict just what sort of an effect a

(17) particular dose would have on one person based on what

(18) it would cause on another.

(19) Q. So you would say that even with the

(20) dose-response scenario, you wouldn't really be able

(21) to determine for an individual what dose of silica

(22) might cause them - might cause an adverse effect?

(23) A. I don't think you could, no. Most of

(24) these studies - like if a study, say, could be done

(25) on humans, what you would do would be to take a

#### Page 105

(1) population and do the study on, and then you would

(2) get different results for different people, but you

(3) would have like an average response.

(4) Q. So, in other words, you could establish it -

(5) at least to an average response you can establish -

(6) A. Yeah, you can have an average response based

(7) on previous work, but you wouldn't know - no, any

(8) particular individual might respond higher or lower

(9) than the average.

(10) Q. Uh-huh. And I guess that's what I'm getting

(11) at, as far as working within that limitation, this is

(12) an average response for people, that given the

(13) dose-response relationships, you can determine what

(14) dose of or what amount of or level of silica would be

(15) needed to cause a toxic effect in humans?

(16) A. An average response, yes.

(17) Q. Yes.

(18) A. Right.

(19) Q. Are there specific biomarkers that indicate

(20) exposure to silica?

#### NOTES

(21) A. Well, of course, they use - x-ray is used as

(22) one, where they'll actually do an x-ray of the lungs

(23) or lung function. These are essentially biomarkers.

(24) Q. Okay. And those would be the biomarkers

(25) specific to silica?

#### Page 106

(1) A. Well, they're not specific to silica, but in

(2) the absence of other exposures, I mean, they would

(3) reflect -

(4) Q. I understand there might be other things

(5) involved.

(6) A. Yeah.

(7) Q. But if you're saying I think this may be

(8) silica exposure, what are the biomarkers you would

(9) look for?

(10) A. Like occupational, you would do both lung

(11) function tests and x-rays.

(12) Q. Okay.

(13) A. And sometimes one - you know, one will be

(14) more sensitive than another.

(15) Q. Okay. And you may have already answered

(16) this, but what exactly is silica?

(17) A. Okay. Silica is essentially silicon dioxide

(18) or silicates,  $\text{SiO}_2$ . They're either the - they're

(19) compounds containing silica and - silica, which is an

(20) element, an oxygen, and in some cases salts, like in

(21) the case - like when you're talking about silicates,

(22) s-i-l-i-c-a-t-e-s. But silica itself is just  $\text{SiO}_2$  or

(23) silicon dioxide.

(24) Q. What are the sources of that? I mean, where

(25) does that come from?

#### Page 107

(1) A. Oh, it comes from mining, basically.

(2) Q. Okay. Can you tell me what the term

(3) absorption coefficient means?

(4) A. Absorption coefficient? How is it used?

(5) Q. Well, see if you agree with me.

Does

- (5) absorption coefficient -- does it not refer to the
- (7) fraction of the amount of chemical taken into the
- (8) body from a particular route of administration?
- (9) A. Well, I think probably a better term is
- (10) fraction absorbed -- absorbed fraction.
- (11) Q. Have you heard the term absorption
- (12) coefficient before?
- (13) A. Well, the problem is the term absorption
- (14) coefficient is also used for spectrophotometry, so
- (15) that's how it's used more often.
- (16) Q. Have you heard it used with regard to
- (17) toxicology?
- (18) A. No, I haven't. I've heard the term absorbed
- (19) fraction.
- (20) Q. All right. Does that refer to -- does
- (21) absorbed fraction mean --
- (22) A. Yeah, I mean, I think we're talking about
- (23) the same thing, but I think a more common term is
- (24) absorbed fraction, so it would be the fraction of
- (25) the dose that is actually absorbed into the system.

Page 108

- (1) Q. Would that be a term that you would apply
- (2) to silica exposure, or is that only for chemicals?
- (3) A. It's for any -- it would be for any chemical.
- (4) Q. Okay. Exposure -- Doctor, exposure and dose,
- (5) are not one in the same term, are they?
- (6) A. Well, they're used synonymously, but the
- (7) doses is usually some concentration, whereas exposure
- (8) is a concentration times time.
- (9) Q. Okay. What about the term biological
- (10) half-life? What does that mean?
- (11) A. Biological half-life refers to how long the
- (12) substance remains in the body, so it's a time for one
- (13) half of it to be eliminated.

## NOTES

- (14) Q. Okay. Is that term applicable for silica?
- (15) A. Yes.
- (16) Q. So if somebody is exposed to silica and it's
- (17) in their body, is it meaningful to use the term
- (18) biological half-life for the silica that they are
- (19) exposed to?
- (20) A. I think it is, yes.
- (21) Q. Okay. Well, then let me ask you this. Isn't
- (22) it true that from five to seven biological half-lives
- (23) a compound is considered completely cleared from the
- (24) body and unable to exert a beneficial or harmful
- (25) effect?

Page 109

- (1) A. About, yes.
- (2) Q. Would that also apply to silica?
- (3) A. Yes.
- (4) Q. Do you know what the biological half-life of
- (5) silica is in humans?
- (6) A. Oh, I would say probably years, but I don't
- (7) know exactly.
- (8) Q. You don't? Okay. Well --
- (9) A. Might be months.
- (10) Q. Okay.
- (11) A. Yeah.
- (12) Q. Let me ask you how you determine what the
- (13) half-life of silica in humans is.
- (14) A. Okay. The way you probably have to determine
- (15) it is to take a -- to take a -- either a sputum sample
- (16) or possibly lung biopsy and do it at successive times.
- (17) Q. Okay. Do you know if that was ever done for
- (18) the Casales? I assume --
- (19) A. Oh, I'm sure it wasn't.
- (20) Q. Okay.
- (21) A. I mean, it's an obviously quite invasive
- (22) procedure. It's not going to be -- you know, most
- (23) of the time this is not going to be done on anyone
- (24) unless you're looking for cancer or something.
- (25) Q. That sounds to me like you're saying you're

Page 110

## NOTES

- (1) not sure of the exact half-life of silica in humans
- (2) generally.
- (3) A. Right, yeah, exactly.
- (4) Q. Did you consider the half-life of silica in
- (5) humans in forming your opinions concerning the
- (6) Casales' exposure to it?
- (7) A. No, not really, because, I mean, the exposure
- (8) to silica causes pulmonary irritation and pulmonary
- (9) damage, even though it has a finite half-life.
- (10) Q. Okay.
- (11) A. Biological half-life, so -
- (12) Q. So I take it - you probably answered my next
- (13) question, which is since you didn't take it into
- (14) account, if you did go back and take into account the
- (15) biological half-life of silica, do you think it would
- (16) change your opinion in any way?
- (17) A. No, not at all, no.
- (18) Q. And that's because?
- (19) A. Because it essentially, you know, it goes in,
- (20) it causes damage to the pulmonary system, and then
- (21) it - and then it leaves, but the scarring - but the
- (22) scarring that has occurred and effect on the lungs
- (23) remains.
- (24) Q. Okay.
- (25) A. So, I mean, it isn't - you know, in general

## Page 111

- (1) it's a mechanism for getting rid of toxic substances,
- (2) but it's, I think, fairly slow in the case of silica.
- (3) Q. Okay. Let me talk to you about - let me ask
- (4) you about metals. What did the metal that you talked
- (5) about do to the Casales?
- (6) A. Okay. I explained that the metal would be
- (7) due to the sandblasting operation, that you would
- (8) get sort of - because of the abrasive nature of
- (9) the silica, that you would be causing essentially a
- (10) removal of metal, which would then

- be - form some
- (11) kind of a condensate or aerosol, and they would
- (12) breathe that.
- (13) Q. Okay. And I'm trying to understand. Are
- (14) silica and metal the same thing?
- (15) A. No. No.
- (16) Q. Okay. Because as you list it in your
- (17) affidavit, you say dust composed of silica, and then
- (18) you also say metal and organic compounds. The organic
- (19) compounds I know are all on Exhibit 4, but you said
- (20) the metal is something separate. So what I'm trying
- (21) to determine is what you were referring to by the
- (22) metal.
- (23) A. Yeah, and, as I mentioned before, when we
- (24) sandblast -
- (25) Q. You're not sure which metal?

## Page 112

- (1) A. Yeah, right, yes.
- (2) Q. Okay. I'm taking it you're saying there was
- (3) metal in the air. Is that -
- (4) A. Yes.
- (5) Q. What did that - what health effects do you
- (6) think that caused?
- (7) A. It could cause - you know, depending upon
- (8) what the metal was, it could cause some kind of
- (9) pulmonary problems. If it's iron, it's going to cause
- (10) less problems than if it was something like zinc or
- (11) cadmium. So I don't know what - exactly what the
- (12) constituency is.
- (13) Q. And I guess what I'm saying is, you know,
- (14) since you put it in there, you put that the metal is
- (15) causing something. I'm just trying to see if you can
- (16) tell me at all what particular problems -
- (17) A. Different metals cause different problems.
- (18) Iron, for example, causes a benign pneumoconiosis.
- (19) Something like welding fume or cadmium or zinc causes

- (20) more severe problems. So depending on the nature of  
 (21) the composition of what was being blasted, I can't  
 (22) tell exactly what the composition is.  
 (23) Q. So is it fair to say that you don't know what  
 (24) exactly metals may or may not have been emitted?  
 (25) A. No, I don't.

Page 113

- (1) Q. You don't know what concentrations of metals  
 (2) may have been in the air in the vicinity of the  
 (3) Casales?  
 (4) A. Correct.  
 (5) Q. You assume that the metals were being emitted  
 (6) based on the fact that there was sandblasting going  
 (7) on?  
 (8) A. Yes.  
 (9) Q. And that's it?  
 (10) A. Right.  
 (11) Q. Okay. And I take it the - when we start  
 (12) talking about exposure levels and periods of exposure  
 (13) that may cause respiratory problems, again, it would  
 (14) depend on which metals you're talking about?  
 (15) A. Right.  
 (16) Q. Or -  
 (17) A. Yes.  
 (18) Q. Okay. So, again, as far as the metals go,  
 (19) again, if we're going to talk about a health problem,  
 (20) it sounds like they're the respiratory problems again,  
 (21) it just might be varying degrees depending on which  
 (22) metals. Is that -  
 (23) A. Correct.  
 (24) Q. Only respiratory problems, or are there any  
 (25) of the other ailments that you attribute to the metal?

Page 114

- (1) A. I think mainly respiratory problems. In some  
 (2) cases, if exposure is sufficient, you get sort of a  
 (3) flu-like condition, so-called metal fume fever, but I  
 (4) suspect -  
 (5) Q. Did the Casales have anything like

## NOTES

- that? I  
 (6) didn't see that.  
 (7) A. Well, I don't know. I suspect it wasn't  
 (8) high enough for that, but it's mainly respiratory.  
 (9) Q. Okay. So is it fair to say we don't know  
 (10) what the exposure levels for the Casales were at any  
 (11) time for any of those metals?  
 (12) A. That's correct.  
 (13) Q. And we don't know - well, again, I guess  
 (14) you would say that any exposure to metals would  
 (15) have been the same as the silica, would have been  
 (16) intermittent over those eight years? Is that your  
 (17) opinion?  
 (18) A. Right, whenever sandblasting occurred.  
 (19) Q. Okay. The route of exposure for the  
 (20) plaintiffs of that would have been just through the  
 (21) air or would that have been other ways -  
 (22) A. Mostly inhalation. It could have been -  
 (23) you know, I don't know that they were drinking from  
 (24) the intracostal canal, but it could have been from  
 (25) ingestion, too, but I think it would be mainly from

Page 115

- (1) inhalation.  
 (2) Q. Okay. It's your opinion, to a reasonable  
 (3) degree of medical and/or scientific certainty, that  
 (4) the Casales were exposed to metals in the air?  
 (5) A. Correct.  
 (6) Q. And, again, you would say that exposure was  
 (7) chronic exposure to it?  
 (8) A. Yes.  
 (9) Q. Okay. Let me ask you this. Is there -  
 (10) well, these are all different metals. Is there any  
 (11) way for you to be able to tell me about what the  
 (12) half-lives of any metals they may have inhaled might  
 (13) have been in their system?

- (14) A. Well, you know, it probably could be  
 (15) determined, but I don't know what they - what they  
 (16) are.  
 (17) Q. In other words, there's no way you can speak  
 (18) to -  
 (19) A. No.  
 (20) Q. - what the half-life of any metal is -  
 (21) A. No.  
 (22) Q. - because you don't even know which  
 (23) metals -  
 (24) A. No.  
 (25) Q. All right. So, in other words, you could

## Page 116

- (1) speak to the half-lives if you knew what metals were  
 (2) involved and what levels they were exposed to?  
 (3) A. Yes.  
 (4) Q. But since you don't know that, you can't tell  
 (5) us?  
 (6) A. Correct.  
 (7) Q. Okay. Let me go to - let's start talking  
 (8) about the organic compounds that are listed in Exhibit  
 (9) 4. The first one I notice is cyclohexane.  
 (10) A. Right.  
 (11) Q. Okay. Let's talk about cyclohexane.  
 (12) A. Okay. Let me just say that what I've done  
 (13) here is indicate which of these - where I found some  
 (14) data. I've indicated which cause neurochemical or  
 (15) neurotoxic effects, and those are actually - that's  
 (16) all coming from this particular table here.  
 (17) Q. Okay. Let me - how about this, we'll talk  
 (18) about cyclohexane first, and you've got notes next to  
 (19) it which are based on the table -  
 (20) A. This table here.  
 (21) Q. Which book is that? Let's take a look. For  
 (22) the record the book is called Neurotoxicity of  
 (23) Industrial and Commercial Chemicals, Volume I. Author  
 (24) is John L. O'Donoghue and that's

## NOTES

O'-D-o-n-o-g-h-u-e.  
 (25) That's from the CRC Press?

## Page 117

- (1) A. Yeah.  
 (2) Q. Okay. It's published, it looks like, in 1985  
 (3) by CRC Press, Inc. And the tables that you're  
 (4) referring to are on pages 86, 87 of this book, is that  
 (5) correct? Am I right?  
 (6) A. That's right.  
 (7) Q. All right. Tell me what it is that those  
 (8) tables told you that you've made notes on about  
 (9) cyclohexane.  
 (10) A. This table indicates neurotoxic effects of a  
 (11) variety of chemicals. The book is - from which it's  
 (12) taken is Neurotoxicity of Industrial and Commercial  
 (13) Chemicals.  
 (14) Q. Exactly.  
 (15) A. Now, so I have gone down the list of  
 (16) chemicals which were in the operations of Hercules  
 (17) and indicated which of them have displayed neurotoxic  
 (18) effects, and I've listed them over here and -  
 (19) Q. Okay. You're referring to what's been marked  
 (20) as Exhibit 4?  
 (21) A. Yeah.  
 (22) Q. And why don't we do it this way. Let me just  
 (23) start with cyclohexane. This is the first one you're  
 (24) talking about, and you said you believe it had  
 (25) neurotoxic effects.

## Page 118

- (1) A. Right.  
 (2) Q. First question I have is how did you  
 (3) determine that substance was being emitted? Was it  
 (4) purely from the exhibit we looked at earlier that  
 (5) shows the barges that were being cleaned and the  
 (6) chemical removed was cyclohexane?  
 (7) A. Yes.  
 (8) Q. It was based solely on that?  
 (9) A. Yes.  
 (10) Q. And that was exhibit - is that

## Exhibit 2?

- (11) A. I'm not sure.
- (12) Q. No, that's Exhibit 3, I believe. All right.
- (13) Okay. All right. When you say neurotoxic effect, can
- (14) you tell us what you mean exactly by that?
- (15) A. Okay. We're talking about any kind of
- (16) effect, either acute or chronic, that applies to
- (17) either humans or animals, and these effects apply
- (18) either to the central nervous system or the peripheral
- (19) nervous system.
- (20) Q. Okay. Are you finished?
- (21) A. Yes.
- (22) Q. Okay. Did you make any determination as to
- (23) how long cyclohexane itself had been emitted? I mean,
- (24) in other words, did you presume it was over eight
- (25) years, or did you look at those - at Exhibit 2 and

## Page 119

- (1) determine discrete time periods that it was being -
- (2) A. Well, it was fairly commonly emitted.
- (3) Q. And I guess what I'm getting at is do you
- (4) have any - do you know exactly or to any degree of
- (5) certainty how long that this cyclohexane was being
- (6) emitted?
- (7) A. No, I just - I merely have those data,
- (8) and, you know, one could make a determination of
- (9) what the frequency of emission was, but I haven't
- (10) done so.
- (11) Q. Okay. Based on -
- (12) A. Yeah.
- (13) Q. All right. So as you sit here today, based
- (14) on that data, could you tell us as you sit here today
- (15) how long you think it was being emitted?
- (16) A. I'd have to look at the - have to look at
- (17) the information, and then I could -
- (18) Q. Was it something that you looked at in

## NOTES

- (19) forming your opinion for the affidavit? Did you
- (20) look at how long it was being -
- (21) A. Well, I looked at whatever chemicals were
- (22) being removed or cleaned.
- (23) Q. Okay.
- (24) A. And -
- (25) Q. I think you see what I'm getting at, which

## Page 120

- (1) is I'm trying to see if you made an assumption - I'm
- (2) presuming for that chemical - I'm not sure if when
- (3) you were doing it you said, "Okay, there was
- (4) cyclohexane. I'm assuming it was being emitted
- (5) constantly over eight years," or did you say, "It
- (6) looks like it was between '92 and '94," do you see
- (7) what I'm saying? Or was that even a factor, that
- (8) you said how long was this particular chemical being
- (9) emitted?
- (10) A. Well, most of those chemicals that were
- (11) listed, or at least a substantial number of them,
- (12) were emitted at different times, and so it was, you
- (13) know, not a single incident but several of them. And
- (14) in some cases like with N-butanol or cyclohexane or
- (15) some others it was not infrequently.
- (16) Q. Okay. And what I want to do is I'll
- (17) probably - I'll talk to you about N-butanol, but I
- (18) want to focus on each chemical, because each one of
- (19) these, from what you're telling us, is harmful.
- (20) A. Yeah.
- (21) Q. So I want to make sure I understand. And it
- (22) sounds like you're saying you would say there's no
- (23) question in your mind that cyclohexane was not being
- (24) emitted continuously during this period?
- (25) A. Well, the complaints - well, if I can look

## Page 121

- (1) at that exhibit.

## NOTES

about 1989 through

(10) 1994, do they?

(11) A. Yeah, exactly.

(12) Q. Do you have any records you reviewed that

(13) would tell us how often cyclohexane may have been

(14) emitted in that five-year period?

(15) A. No, I haven't seen any such -

(16) Q. Did you make any assumptions about that based

(17) on your conversations with the Casales or -

(18) A. I had - well, I have, of course, information

(19) from them that there were odors released since 1989,

(20) but I don't know what they were, because it was

(21) noxious odor released, and then there was a styrene

(22) odor in '92, so I don't know - I don't know all of

(23) the chemicals.

(24) MR. FUERST: Let's go off the record for just

(25) a second.

Page 123

(1) [Recess]

(2) MR. JORDAN:

(3) Q. Doctor, we were just talking about

(4) cyclohexane and what material you had that you

(5) could base on - to determine how long this substance

(6) had been emitted in the vicinity of the Casales'

(7) residence. Do you remember that?

(8) A. Yes.

(9) Q. And I take it the only - the only thing

(10) you have that tells you how long it was being - they

(11) were being exposed to that or it was being emitted was

(12) Exhibit No. 3?

(13) A. Correct.

(14) Q. And that indicates to you that it was an

(15) intermittent - some sort of intermittent exposure,

(16) right?

(17) A. Yes.

(18) Q. All right. Do you have any idea what

(19) concentrations of cyclohexane were being emitted

(20) at any time?

(21) A. No, I don't.

(2) Q. Sure.

(3) A. Let's see, here it is. Okay. Here's what

(4) I'm getting at. For example, let's take cyclohexane.

(5) All right. It was emitted on June 16th, '94; then

(6) June 22nd, '94; then June 24th, '94; and then July

(7) 28th and 29th, '94; then August 14th to August 24th,

(8) '94; September 15th, '94; September 16th, '94;

(9) September 21st; September 22nd; September 24th;

(10) September 27th; September 28th; October 10th; October

(11) 14th; October 16th; November 8th; November 23rd and

(12) so on. And so, you know, each chemical has a

(13) particular - probably a different spectrum of how

(14) often it was -

(15) Q. I understand, Doctor. And you're talking

(16) about - you're referring to the first - I guess

(17) pages 2 and 3 of Exhibit No. 3?

(18) A. Yes.

(19) Q. Can you point out to me after pages 2 and 3,

(20) which are in 1994 - can you point out for me for

(21) the rest of 1994, all of 1995 and into 1996 where

(22) cyclohexane was - there are - there are some others,

(23) but it looks to me like there are many, many months -

(24) A. Yeah, the next one I see is March '95.

(25) Q. Okay. So we are going from November 23 of

Page 122

(1) 1994 to March of '95 we know that there's no -

(2) A. Yeah, and then there are several in March.

(3) Q. Okay. Is it - so I guess that's what I'm -

(4) A. This continued - it's not exactly -

(5) Q. It's not continuous?

(6) A. It's not continuous, and it's not evenly

(7) distributed.

(8) Q. And these records only show us 1994 through

(9) 1996. They don't show us anything

- (22) Q. And so I take it you don't have any idea  
 (23) what any concentration of cyclohexane at their  
 (24) residence would have been at any time?  
 (25) A. No.

Page 124

- (1) Q. What types of health effects do you see in  
 (2) humans from exposure to cyclohexane? And so you know,  
 (3) I'm talking about specific ailments.  
 (4) A. Okay. It causes neurotoxic problems.  
 (5) Q. Why don't I make - why don't I be more  
 (6) specific. What specific ailments that the Casales  
 (7) have complained about -  
 (8) A. Well, most - I think maybe we can shorten  
 (9) this by saying that they - you know, their complaints  
 (10) fall into several categories, mainly - mainly  
 (11) neurological problems, partly liver problems and  
 (12) perhaps some either muscular or joint problems, and  
 (13) so - and basically the thrust of my argument is that  
 (14) a fair number of these compounds are documented to  
 (15) cause neurological problems.  
 (16) Q. Well, why don't we go off of your affidavit  
 (17) as to what the - as to specific problems that they  
 (18) had, and I'll just go past each one, and you can tell  
 (19) me if you think cyclohexane had anything to do with  
 (20) that. Is that fair?  
 (21) A. Sure.  
 (22) Q. Okay. You said that they had problems with  
 (23) sleep loss. Is cyclohexane, you think, a cause of  
 (24) that?  
 (25) A. Yes.

Page 125

- (1) Q. Okay. Loss of smell?  
 (2) A. I'm not sure about that.  
 (3) Q. Impaired hearing?  
 (4) A. I'm not sure.  
 (5) Q. Sinus problems?  
 (6) A. Probably.  
 (7) Q. Itchy, watery eyes?

# NOTES

- (8) A. Probably.  
 (9) Q. Respiratory distress?  
 (10) A. Probably.  
 (11) Q. Headaches?  
 (12) A. Yes.  
 (13) Q. Okay. Nausea and vomiting?  
 (14) A. Yes.  
 (15) Q. Muscle aches and muscle loss?  
 (16) A. Probably.  
 (17) Q. Severe dizziness and loss of balance?  
 (18) A. Yes.  
 (19) Q. Okay. Numbness in hands?  
 (20) A. I don't know.  
 (21) Q. Acute bronchitis?  
 (22) A. Probably.  
 (23) Q. Liver problems?  
 (24) A. Probably.  
 (25) Q. Okay. You said yes to headaches, so I assume

Page 126

- (1) you would say yes to severe headaches?  
 (2) A. Yes.  
 (3) Q. Skin irritation?  
 (4) A. I would say probably.  
 (5) Q. Cough?  
 (6) A. Yes.  
 (7) Q. Elevated cholesterol?  
 (8) A. I don't know.  
 (9) Q. Okay. Okay. Are there - let me go through  
 (10) these. Are there other potential causes for sleep  
 (11) loss other than any of the chemicals that you believe  
 (12) they were exposed to?  
 (13) A. Yes.  
 (14) Q. Okay. Can you tell me what method you used  
 (15) to rule out other potential causes in order to opine  
 (16) that their health problems are more than 51 percent -  
 (17) let's talk about sleep loss first - was more than 51  
 (18) percent probability due to exposure to chemicals?  
 (19) A. Well, sleep loss, of course, can be caused by  
 (20) a variety of things, including stress, discomfort and  
 (21) so on. And it's - so it's often hard to dissociate,  
 (22) you know, all of the separate factors. They all come  
 (23) together and cause difficulty in sleeping. So, I  
 (24) mean, I don't know if that answers

your question,  
(25) but I can't - I'm unable to say that any particular

Page 127

(1) thing caused sleep loss. In some cases it may be  
(2) biological, in some cases psychological, may be a  
(3) stress factor or other factors, so on.  
(4) Q. So you understand where I'm getting at, with  
(5) your affidavit, and I presume your testimony at trial,  
(6) you're going to be saying that these chemicals caused  
(7) these people to have sleep loss, and presumably, as  
(8) we've just established, there are other things other  
(9) than exposure to chemicals which could cause sleep  
(10) loss?  
(11) A. Yeah.  
(12) Q. What I'm asking you is what you did, if  
(13) anything, to rule out other potential causes of sleep  
(14) loss.  
(15) A. Well, first of all, I never said that the  
(16) chemicals themselves only cause sleep loss, I don't  
(17) believe. This whole process, including the irritating  
(18) effects of the chemicals, noises from the operations,  
(19) smells and so on, all these acted together in concert  
(20) to cause sleep loss. Some of them may have been  
(21) biological effects or chemical effects, in other cases  
(22) psychological.  
(23) Q. Okay. How about this? This will make this  
(24) easier. I'll refer you to your affidavit and all the  
(25) problems that you listed, all the different ailments

Page 128

(1) that they told you about and that you listed?  
(2) A. Yeah.  
(3) Q. Did you do anything with regard to any of  
(4) those ailments to try and rule out other potential  
(5) causes of those ailments?  
(6) A. I acknowledged that they happen, but what

# NOTES

(7) I'm saying is that the exposure to all of these  
(8) chemicals, including noises and odors, added to or  
(9) interacted with other factors to cause sleep loss.  
(10) Q. Would you admit that for all these ailments  
(11) that they're complaining of it's possible that they  
(12) could have been caused solely by something that  
(13) doesn't have anything to do with their exposure to  
(14) the chemicals or to being close to Hercules' facility?  
(15) A. That, of course, is possible, but very  
(16) unlikely, given the whole cluster of symptoms. I  
(17) mean -  
(18) Q. Well, let me ask you this. With regard to  
(19) something like sleep loss - we've already talked  
(20) about respiratory problems. Let's talk about  
(21) Mrs. Casale and sleep loss. Are you aware that  
(22) she had been on a medication called ampicillin?  
(23) A. Yeah.  
(24) Q. You were?  
(25) A. I'm not sure I - I -

Page 129

(1) Q. Because you hadn't told me that earlier -  
(2) A. Yeah.  
(3) Q. - in the medications that you listed.  
(4) A. That was for some infection, obviously.  
(5) Q. Right. Were you aware that one of the side  
(6) effects of that is insomnia? Did you know that?  
(7) A. No.  
(8) Q. Okay. Were you aware that she was also on  
(9) another drug called Ansaid?  
(10) A. No, I wasn't.  
(11) Q. Okay. Were you aware that insomnia is also  
(12) a side effect of that drug?  
(13) A. No, I wasn't.  
(14) Q. Are you aware that she was also on a drug  
(15) called Augmentin?  
(16) A. No.

(17) Q. Okay. Do you know that a side effect of that  
 (18) drug is actually anxiety insomnia?  
 Did you know that?  
 (19) A. No.  
 (20) Q. Okay. We've already covered that you weren't  
 (21) aware that she was on a drug called Ru-Tuss?  
 (22) A. Correct.  
 (23) Q. Right. And that -  
 (24) MR. FUERST: Hold on a second. I don't think  
 (25) that's right. That's in his affidavit. I think we

Page 130

(1) pointed that out earlier.  
 (2) MR. JORDAN:  
 (3) Q. Okay. And I'm going off of your testimony  
 (4) earlier, so that you know, as to what drugs she told  
 (5) you she was on, and you may not have remembered that  
 (6) she told you she was on Ru-Tuss.  
 (7) A. Yeah, I may not have.  
 (8) Q. Okay. And you probably - I don't know, were  
 (9) you aware that insomnia is also a side effect of  
 (10) Ru-Tuss?  
 (11) A. Well, I'm sure it is a side effect of a lot  
 (12) of drugs.  
 (13) Q. We talked about Symmetrel earlier. That's an  
 (14) antiviral drug. I don't think she told you she had  
 (15) been on that drug, did she?  
 (16) A. I don't know.  
 (17) Q. Okay. Insomnia is also a side effect of that  
 (18) drug. Did you know that?  
 (19) A. No.  
 (20) Q. Okay. We've got five different drugs that  
 (21) she was on that have either insomnia or anxiety  
 (22) insomnia. Isn't it possible that any one or a  
 (23) combination or interaction of those drugs were  
 (24) causing her to have sleep loss?  
 (25) A. I agree that they could have been

Page 131

(1) contributing factors, but her state of health and  
 (2) irritation of the chemicals and noises could also

# NOTES

(3) have been contributing.  
 (4) Q. The fact that you didn't know she was on it  
 (5) least some of those drugs, would that at least have  
 (6) some impact on your opinion concerning the cause of  
 (7) her problems regarding loss of sleep?  
 (8) A. You mean like regarding loss of sleep?  
 (9) Q. Yeah.  
 (10) A. Yeah. Well, you know, I said earlier, I  
 (11) believe, that, you know, I recognize that that could  
 (12) be caused by other problems, too.  
 (13) Q. Right. I mean, it's possible that her loss  
 (14) of sleep was caused only by those drugs, isn't it?  
 (15) A. It is possible, yeah.  
 (16) Q. Okay. What is - do you know generally  
 (17) what the exposure level, both in terms of dosage -  
 (18) I'm talking about parts per billion in the air - as  
 (19) well as time of exposure, for cyclohexane is in order  
 (20) to cause an effect in humans?  
 (21) A. I can't - I can't give you a number -  
 (22) Q. Okay.  
 (23) A. - for - you know, for any of these, nor  
 (24) do I know what level there was in the air.  
 (25) Q. Okay.

Page 132

(1) A. Because there wasn't any monitoring done.  
 (2) So that, you know, I merely have to claim that I just  
 (3) don't - I don't know what the level was, nor do I  
 (4) know -  
 (5) Q. Okay. And I see what you're saying. How  
 (6) about this, we say for all of the organic compounds  
 (7) referred to in Exhibit 4, and many of which are listed  
 (8) in your affidavit, it's your testimony that you don't  
 (9) know what the concentration of those substances was in  
 (10) the vicinity of the Casales' home at any time?

- (11) A. Right.  
 (12) Q. You don't -  
 (13) A. I know that it was sufficiently - that at  
 (14) least some of them were sufficiently high so that  
 (15) odors were observed.  
 (16) Q. Okay.  
 (17) A. But I don't know - I also don't know which  
 (18) of the chemicals were actually observed.  
 (19) Q. Okay. And you don't know how long  
 (20) specifically any of those chemicals were emitted? I  
 (21) take it your testimony would be that you were assuming  
 (22) they were emitted intermittently?  
 (23) A. In some cases they were emitted, you know,  
 (24) for a day or two or even on and off for ten days, but  
 (25) it's not - it is not the same for all of them, and it

## Page 133

- (1) varied from time to time.  
 (2) Q. Okay. So the best that you can tell us - in  
 (3) other words, I'm saying you can't be any more specific  
 (4) as far as how long they were exposed than to say it  
 (5) was an intermittent exposure?  
 (6) A. Right, precisely.  
 (7) Q. The route of exposure for all those  
 (8) chemicals, I take it, would have been by the air?  
 (9) A. Mainly inhalation, yes, right.  
 (10) Q. Is there anything - any other method of  
 (11) exposure for any of those chemicals in Exhibit 4  
 (12) other than by air?  
 (13) A. There was, I guess, a slight amount of  
 (14) ingestion or oral is possible, because like if some  
 (15) of the - if the person, say, swallowed some of the  
 (16) particulate and then the chemical was absorbed on  
 (17) the dust or particulate, then it would be ingestion.  
 (18) Q. Well, how about this, would that manner of  
 (19) exposure make any difference in your opinions?  
 (20) A. It might make some difference in

## NOTES

- terms of  
 (21) what the precise toxic effects, but I would say that  
 (22) the main route was inhalation.  
 (23) Q. Okay. And the fact that some of them may -  
 (24) you said there may have been ingestion, that could  
 (25) have applied to any of those chemicals in Exhibit 4?

## Page 134

- (1) A. Yes, and also there could have been a small  
 (2) amount of dermal absorption where it got on their  
 (3) skins and was absorbed slightly.  
 (4) Q. But you don't know one way or another whether  
 (5) they did ingest it?  
 (6) A. No.  
 (7) Q. You don't know one way or another whether  
 (8) there was absorption?  
 (9) A. No, it would mainly be inhalation.  
 (10) Q. And for all those chemicals on Exhibit 4, you  
 (11) don't know the level of exposure or the concentration  
 (12) near their house?  
 (13) A. Correct.  
 (14) Q. And do you know what the - can we go through  
 (15) what the biological half-lives - do you know the  
 (16) biological half-lives of any of the chemicals or the  
 (17) organic compounds listed on Exhibit 4?  
 (18) A. No, I don't. I'd say that the - in general  
 (19) the most nonpolar - for example, like cyclohexane,  
 (20) benzene, toluene, xylene, hexane would tend to be -  
 (21) would tend to remain longer in the body, so that  
 (22) they would have a longer half-life than things like  
 (23) N-butanol, which would be - which is polar and  
 (24) tends to be excreted more easily. So, in general,  
 (25) the nonpolar substances have a longer half-life.

## Page 135

- (1) Q. Okay. But as far as each specific substance  
 (2) you couldn't tell us what the biological half-life is?

## NOTES

- (3) A. No, I mean, it's something that could be
- (4) looked up, but recognize that there are some 40
- (5) compounds here and --
- (6) Q. And that's what I'm saying is -- I'm talking
- (7) specifically about the biological half-life in humans
- (8) of any of those substances that you're saying the
- (9) Casales were exposed to, you couldn't tell us as you
- (10) sit here what the half-life of any of those substances
- (11) in a human is?
- (12) A. No.
- (13) Q. Is that no?
- (14) A. That's no.
- (15) Q. Did you -- let me ask you this. For any of
- (16) the substances on Exhibit 4, any of those organic
- (17) compounds or chemicals, did you consider or account
- (18) for the biological half-life in humans of that
- (19) substance in forming your opinion?
- (20) A. Indirectly, in that the compounds which tend
- (21) to have longer half-lives are the more hazardous, more
- (22) toxic, so in that sense --
- (23) Q. Only to that degree?
- (24) A. Yes.
- (25) Q. All right. Doctor, are you familiar with

## Page 136

- (1) the American Conference of Governmental Industrial
- (2) Hygienists?
- (3) A. I am.
- (4) Q. Okay. And you've mentioned the term TLV
- (5) before. Isn't, I guess, the -- I'm going to start
- (6) referring to it as the ACGIH. I'm sure you've heard
- (7) that term many times.
- (8) A. Sure.
- (9) Q. The ACGIH determines permissible exposure
- (10) levels to chemicals, don't they?
- (11) A. Well, they and OSHA, Department of Labor, and
- (12) also NIOSH, National Institute of Occupational Safety
- (13) and Health. Other groups, too, but they're one of the

- (14) main groups, yeah.
- (15) Q. Okay. But the ACGIH does determine
- (16) permissible exposure levels to chemicals?
- (17) A. Yeah.
- (18) Q. And you may have said this before, so I
- (19) apologize for being redundant, but what is a TLV?
- (20) A. Threshold limit value.
- (21) Q. You correct me if I'm wrong. My understanding is that the definition of TLV is the
- (22) time-weighted average concentration for a normal
- (23) eight-hour workday and a 40-hour work week to which
- (24) nearly all workers may be repeatedly exposed day

## Page 137

- (1) after day without adverse effect.
- (2) A. That's the common parlance, but it's --
- (3) Q. Would you agree with that definition?
- (4) A. No, I don't agree with it. I don't agree
- (5) with it for some fairly simple reasons. One, that
- (6) when it was initially -- when it was initially
- (7) formulated, it wasn't -- it wasn't claimed to protect
- (8) workers against ill health. It was -- it represented
- (9) a -- sort of a best guess at what -- at what
- (10) technology would allow these levels to be.
- (11) And, secondly, because these levels are
- (12) constantly revised, and almost entirely revised
- (13) downwards as more knowledge, more information comes
- (14) out about them, in some cases there's about a
- (15) hundred -- a hundredfold reduction in the amount
- (16) allowed. That means that they couldn't have been
- (17) protecting health earlier when they were -- the
- (18) levels were set higher, so that the actual practice
- (19) in terms of the TLVs argues against their protecting
- (20) against ill health from exposure.

- (21) Q. Well, let me ask you if the definition I
- (22) just gave you, though, is generally accepted as the
- (23) definition -
- (24) A. Well, it depends on who you ask. If you
- (25) talk - if you talk with industry, yes, they'll

Page 138

- (1) accept that.
- (2) Q. Well, let's talk about, for instance, the
- (3) ACGIH. Is that the definition that's accepted by
- (4) the ACGIH?
- (5) A. Well, since they're formulating it, yes.
- (6) Q. Can you point me to another group, like NIOSH
- (7) or another one that you know, that does not accept
- (8) that definition?
- (9) A. Well, I don't - you know, I don't know if
- (10) they all - if these different groups have actually
- (11) written comments about this, but there are - there
- (12) are papers in the literature which have argued about
- (13) this.
- (14) Q. Well, let me ask you this. Do you have a
- (15) definition that you would use for TLV? And, if so,
- (16) I would ask that you tell us what it is.
- (17) A. I would say it's the - it's the level at
- (18) which - the time-weighted average air level which is
- (19) permitted by present day technology and is attempting
- (20) to protect the worker. That's what - more what I
- (21) would say. In other words, it doesn't - you can't
- (22) tell the worker that he's protected at the TLV,
- (23) because he's not.
- (24) Q. Okay.
- (25) A. Because every time new information comes

Page 139

- (1) out and the level is reduced, then that is a complete
- (2) indication of the fact that it was too high before.
- (3) Q. Okay. Is that term TLV something

## NOTES

- that the
- (4) ACGIH came up with themselves?
- (5) A. Yes, it's actually copyrighted.
- (6) Q. Okay. Is it a term that you see used other
- (7) than by the ACGIH, outside?
- (8) A. No. Oh, well, I mean, it's referred to, but
- (9) it's an ACGIH invention.
- (10) Q. Okay. Is there another term - you've just
- (11) given us a definition that you would use for TLV. Is
- (12) that based on any particular literature or document?
- (13) A. It - well, it's based on my view of the
- (14) situation as well as reading in the literature. I
- (15) can't give you any references now, but there have
- (16) been several articles that deal with that whole
- (17) question, and it - what it - the definition I
- (18) gave you indicates that it's merely an attempt to
- (19) protect the worker, and it cannot be - there is no
- (20) complete - no complete indication that it will, in
- (21) fact, protect the worker.
- (22) Q. Okay. And, I'm sorry, I didn't mean to
- (23) interrupt you. I was going to ask you if you could
- (24) tell me, if you can, what articles - you said there
- (25) are several articles.

Page 140

- (1) A. I can't give you the references right now. I
- (2) could provide them.
- (3) Q. Okay. I'd appreciate it if you could. Do
- (4) you know what the TLV is - I understand that you have
- (5) a problem with the term, but do you know what the TLV
- (6) is for any of the organic compounds or chemicals?
- (7) A. I would have to look them up. I don't
- (8) remember.
- (9) Q. Let me just close the hurdle on this. So as
- (10) you sit here today, you couldn't tell us what the TLV
- (11) is for any of the chemicals, the

organic compounds

(12) that are listed on -- I believe it's Exhibit 4? You

(13) couldn't tell us what the --

(14) A. Well, benzene is one part per million, I know

(15) that, and, you know, I could guess at some of the

(16) others, but I would rather not.

(17) Q. Okay. So benzene, you said, is -- that's one

(18) part per -- forgive me. I might get a --

(19) A. One part per million.

(20) Q. Of air particles?

(21) A. No, it's a gas. It's a vapor.

(22) Q. So when you say one part per million, it's

(23) one part per million of what?

(24) A. One part per million of benzene in air. So

(25) it's one part per million -- one part of benzene and

Page 141

(1) one million parts of air by volume. So they're all

(2) volume.

(3) Q. So it would be -- so that would be for

(4) benzene -- the TLV, it would be one part of benzene

(5) per one million particles of air?

(6) A. Yeah, it's like one liter of benzene per one

(7) million liters of air.

(8) Q. And that would be the TLV for benzene?

(9) A. Yes.

(10) Q. Do you know that for -- you said you don't

(11) know it for sure on any of the others.

(12) A. I would have to look at them. Oh, well, I

(13) have one here for cyclohexane that I wrote. That's

(14) 300 parts per million.

(15) Q. Okay. Cyclohexane is again 300 parts per

(16) million particles of air?

(17) A. Yeah.

(18) Q. Do you have any of the others written down

(19) there?

(20) A. I don't -- I don't believe so. I mean, I'd

(21) have to look.

(22) Q. Okay. Well, and I think I already know your

(23) opinion on this, but let's just go ahead and ask you.

## NOTES

(24) Is it your opinion that for any of those chemicals on

(25) Exhibit 4, that exposure to amounts under the TLV

Page 142

(1) would be safe?

(2) A. Well, I guess I would answer that by saying

(3) that the less the levels were, the safer it would be,

(4) and that just because it's under the -- well, because

(5) it's under the TLV does not mean that it's safe. And

(6) that's only -- and that's for a working person.

(7) But what you're talking about is community

(8) standards, and community standards, what few community

(9) standards or ambient air standards have been

(10) formulated are always below the TLV. So some states

(11) have developed it, and what they do is they start

(12) off with the TLV and then divide by a hundred or a

(13) thousand, some safety factor, depending on the data

(14) that are available, and so then the TLV would be,

(15) say, one-one hundredths of the -- I'm sorry, the

(16) community or ambient level would be one-one hundredth

(17) of the TLV.

(18) Q. Okay.

(19) A. So that no one is suggesting that the

(20) occupational standards be used for ambient air

(21) standards.

(22) Q. Okay. And you just brought up a couple of

(23) things I need to ask you about.

(24) A. Yeah.

(25) Q. But I want to make sure I understand that

Page 143

(1) you wouldn't say then -- you wouldn't agree that if

(2) there's an exposure below the TLV to a chemical that

(3) that's safe?

(4) A. No, I wouldn't agree to that.

(5) Q. Okay. You said several states had come up

(6) with these. What states?

(7) A. A number of them and not - I'm just  
 (8) wondering - I don't know whether Texas has or not,  
 (9) but I could find out for you. I don't know offhand.  
 (10) Q. Okay.  
 (11) A. But there are - but it's - you know, it's  
 (12) the simplest way to come up with community standards,  
 (13) and there's a lot of arguments about it, but you start  
 (14) out with a TLV and then divide by a safety factor.  
 (15) Q. How about this? I'll ask as broad as I can.  
 (16) For these community standards that you say are below  
 (17) the TLV and a fraction of the TLV, can you tell me any  
 (18) state, including Texas, or any law or any EPA document  
 (19) or any treatise where I can find the basis for those  
 (20) standards or, you know, those standards codified or  
 (21) anything like that?  
 (22) A. I have seen some discussion of this, and I  
 (23) could - I mean, I could try to get, you know, get  
 (24) some material, but the basic philosophy is that first  
 (25) of all community standards are for 24 hours rather

Page 144

(1) than eight hours, so they have to be - because of  
 (2) that, they have to be lower.  
 (3) Secondly, they have to be lower because  
 (4) you're working - in the community you have a  
 (5) population consisting of individuals who are invalid,  
 (6) who are elderly, disabled and very young, and so they  
 (7) have to be protected even further. You also have  
 (8) pregnant mothers. And so you have a large number  
 (9) of people who need better protection than does the  
 (10) worker.  
 (11) And the third - the third point is that  
 (12) they need time for repair of damage, so that that's  
 (13) why this - so that - I'm sorry, they

# NOTES

have to allow  
 (14) for repair of damage from working for eight hours, so  
 (15) that they can't use the same level, because then there  
 (16) would be no repair.  
 (17) Q. And it sounds to me like - if you can get  
 (18) back to us with any materials on that -  
 (19) A. All right, sure.  
 (20) Q. - that would be great. Are there any  
 (21) studies or any medical or scientific things you can  
 (22) refer us to with regard to establishing levels of  
 (23) exposure for nonworkers? You're saying you're looking  
 (24) at a 24-hour period as opposed to eight-hour period.  
 (25) Is there any documentation on that you can refer us

Page 145

(1) to?  
 (2) A. Well, EPA probably has some material on  
 (3) that. Is that - did I misinterpret what you're  
 (4) asking?  
 (5) Q. Yeah, I'm - because you're saying that you  
 (6) would furnish things, and I was seeing if there was  
 (7) anything that came to mind that you've reviewed or  
 (8) that you've seen that would address this particular  
 (9) distinction you're making.  
 (10) A. Well, I know it's been discussed by EPA,  
 (11) and the whole question of establishing standards -  
 (12) standards for toxic substances in the ambient  
 (13) environment, and very little has been done on that.  
 (14) Q. Okay. So there's very little to go on in  
 (15) determining -  
 (16) A. Yeah, right.  
 (17) Q. - in determining what exposure level for  
 (18) over a 24-hour period would be dangerous or not?  
 (19) A. Yeah. Well, there's some information, of  
 (20) course.  
 (21) Q. But it's extremely limited? Is that

what

(22) you're telling me?

(23) A. Yeah.

(24) Q. Okay. You're familiar with OSHA, right?

(25) Occupational Safety & Health Administration?

Page 146

(1) A. Yes.

(2) Q. They also determine permissible exposure

(3) levels, PELs, to chemicals, right?

(4) A. Right.

(5) Q. And a PEL is a permissible exposure level,

(6) right?

(7) A. Right.

(8) Q. As defined by OSHA. Do you know what the PEL

(9) for any of the chemicals on Exhibit 4 is?

(10) A. Some of them have been adopted from ACGIH,

(11) and some are then modified.

(12) Q. Okay.

(13) A. So generally they're, you know, fairly close

(14) to ACGIH TLVs.

(15) Q. Okay. They should be close to them?

(16) A. Yeah, mostly.

(17) Q. And I just wondered, as we sit here today,

(18) you could not go through each one of the chemicals in

(19) Exhibit 4 and tell me what the PEL as established by

(20) OSHA is?

(21) A. No, I can't.

(22) Q. Do you think - is it your opinion, though,

(23) that the PELs established by OSHA - are they health

(24) protective?

(25) A. I think it's the same thing as with the TLVs,

Page 147

(1) that they strive to be, but they're all based on what

(2) information is available at that particular time.

(3) Q. Okay.

(4) A. And sometimes there are political considerations, too, like they may have opposition

(5) from some - from the company that's producing the

(7) particular chemical that does not want to reduce and

# NOTES

(8) makes some very strenuous objections.

(9) Q. Is it your opinion that there is a certain

(10) level of exposure to any of the chemicals listed in

(11) Exhibit 4 that is not going to be associated with

(12) health effects?

(13) A. Yeah, probably if it's - you know, if it's

(14) noncarcinogenic and it's below the threshold, then it

(15) probably will have at least minimal health effects,

(16) but the threshold - the threshold is not the

(17) threshold limit value. It's what's called the no

(18) effect level, so -

(19) Q. And that's what I'm getting at.

(20) A. Yeah.

(21) Q. Could you tell us in your opinion for each

(22) one of the chemicals on Exhibit 4 - could you go

(23) through each one of those with me and tell me this

(24) is the no effect level?

(25) A. No, I can't do that. No, I can't.

Page 148

(1) Q. Okay. So you couldn't? And you see what I'm

(2) asking you, right? On Exhibit 4, like cyclohexane,

(3) could we go through and you tell me this chemical at

(4) this level, no effect, that or anything below?

(5) A. No, I can't. For one thing, it may not have

(6) been established for all of them. For another thing,

(7) I just don't - I haven't done the research to

(8) determine what the no effect level is. What I can

(9) say is what I said before, that the lower the

(10) concentration, the more protective it is.

(11) Q. Okay. You said that you think there may be

(12) some synergistic effects -

(13) A. Yes.

(14) Q. - between those chemicals?

(15) A. Yes.

(16) Q. Can you tell the jury what you mean by that,

(17) "synergistic"?

(18) A. Okay. What I mean by that is that the -

(19) let's say two chemicals, A and B, are - that an

(20) individual is exposed to two chemicals, A and B.

(21) Then the toxic effect from that mixture would be

(22) greater than the sum of the toxic effects from the

(23) two separate exposures.

(24) Q. Okay.

(25) A. And it's usually multiplicative. So if it's

Page 149

(1) synergistic, it's usually the effect of A times the

(2) effect of B, rather than the sum of the two. The sum

(3) of the two is additive; the product is synergistic.

(4) Q. Okay. Can you tell us if any of the (5) chemicals or the silica or any of the different

(6) substances you say that the Casales were exposed

(7) to - are there any of those that you believe had

(8) a synergistic relationship in this case?

(9) A. I think they probably did, but I can't -

(10) I can't say which compounds would undergo that

(11) synergism. I mean, we have - we've got approximately

(12) 40 compounds listed here, and so the likelihood of at

(13) least - of two or more undergoing some synergism is

(14) probably pretty high.

(15) Q. But you don't know whether there actually

(16) was or not?

(17) A. No, no.

(18) Q. I mean, there could have been no synergism

(19) between any of them, isn't that right?

(20) A. There could have been no synergism. There

(21) could have been additivity.

(22) Q. Sure, and you couldn't tell me -

(23) A. No.

(24) Q. - any two chemicals or substances off the

(25) bat that you think did have necessarily synergism?

Page 150

(1) A. No, I couldn't.

## NOTES

(2) Q. Isn't it also -

(3) A. Well, actually, I can tell you. Like, for

(4) example, ketones, like acetone and normal hexane,

(5) undergo - there is some synergism there, so that

(6) particular pair, the acetone and hexane, probably

(7) is going to undergo synergism.

(8) Q. Okay. Can you tell me what -

(9) A. And also - oh, and some others, ethanol

(10) and carbon tetrachloride and propanol and carbon

(11) tetrachloride with regard to liver and kidney

(12) toxicity.

(13) Q. Well, let's start with the first two you

(14) mentioned. Can you refer me to what medical document

(15) that backs up the fact you say they're synergistic?

(16) A. I've read some articles suggesting that

(17) hexane - hexane and ketones have a synergistic

(18) relationship, but I can't give you a citation of it.

(19) Q. Is that something else you could find out?

(20) A. Yeah, I think so.

(21) Q. What about the second two?

(22) A. Okay. That's extremely well known, carbon

(23) tet. Carbon tetrachloride and ethanol is a classic

(24) case, and, in fact, I've cited it in my book, I

(25) believe. Let's see, yeah, page 230 here. It's

Page 151

(1) alcohols and carbon tetrachloride with regard to

(2) hepatic and renal damage, and there's some -

(3) several references here, so -

(4) Q. Okay. And your book again is Environment and

(5) Health?

(6) A. Yes, Environment and Health.

(7) Q. And your book has references to other

(8) documents?

(9) A. Yes.

(10) Q. Doctor -

(11) A. And there are probably others, but I don't

(12) know. You know, I would have to go through them.

(13) Q. Doctor, aren't there also relationships

(14) between chemicals where they're negative antagonistic?

(15) A. Yes, they are.

(16) Q. And what does that mean?

(17) A. That means that you have - that the effect

(18) of the combined exposure is less than the sum of the

(19) two exposures if they're given separately.

(20) Q. All right. Is it fair to say they cancel

(21) each other out, at least to some degree?

(22) A. They at least - they may partly cancel each

(23) other out. Like apparently an example of that is

(24) benzene and toluene.

(25) Q. Okay.

#### Page 152

(1) A. And -

(2) Q. So let me ask you that. Are there any

(3) chemicals on Exhibit 4 that as you look at that, the

(4) substances that you've noted the Casales were exposed

(5) to, that you believe were negative antagonistic?

(6) A. The only one I'm aware of is the benzene and

(7) toluene.

(8) Q. Okay. Benzene and toluene. None of the

(9) others?

(10) A. I'm - I don't know. I don't know.

(11) Q. Okay. If you have a negative antagonistic

(12) relationship, that may affect what - the significance

(13) of the exposure; is that right?

(14) A. Right. Yeah, there's one other one, I guess,

(15) caustic soda and we have hydrochloric acid here, so

(16) those two would - if those molecules found each

(17) other, then they would interact and there would be a

(18) neutralization.

(19) Q. Okay. Any others that you think there would

(20) be a neutralization?

(21) A. I don't know. I can't think of any.

#### NOTES

(22) Q. Okay. One point. After you've talked about

(23) all the chemicals, you mentioned in your affidavit,

(24) you say, "The symptomatology noted for the two Casales

(25) is not all inclusive." And I take it you're talking

#### Page 153

(1) about the medical.

(2) A. Yes.

(3) Q. Are there any other medical problems other

(4) than what we've gone through? And we went through all

(5) of them earlier. Any other medical problems? Because

(6) you say it's not all inclusive. Any other medical

(7) problems that you can tell us about today that you

(8) believe were caused by their exposures to

(9) substances -

(10) A. I'd have to go - whatever's in their

(11) affidavit, those are the only ones I'm aware of, and

(12) I don't know, you know, if I mentioned every single

(13) one of them in my affidavit. So basically the ones

(14) they complained of in their affidavits.

(15) Q. Okay. All right. I want to understand your

(16) definition based on what you said in your affidavit,

(17) you say the adverse health effects from the Casales

(18) are, in your opinion, to a high scientific likelihood,

(19) due to exposure to the substances noted in your

(20) affidavit.

(21) A. Right.

(22) Q. When you use the term "high scientific

(23) likelihood," do you mean simply more than 51 percent

(24) probability?

(25) A. Yes, yes.

#### Page 154

(1) Q. That's what you mean by high scientific

(2) likelihood?

(3) A. Yes.

(4) Q. When you say the symptoms that the Casales

(5) suffered are consistent with those reported in the

(6) literature as a result of exposure to mixtures of  
 (7) solvents and other irritating substances, when you  
 (8) say "the literature," can you tell me what you mean  
 (9) by that?  
 (10) A. Okay. I mean like this - this is a  
 (11) compilation of neurotoxic effect of chemicals, and  
 (12) it - so, for example, just like carbon tetrachloride,  
 (13) for example, causes central nervous system depression,  
 (14) mental confusion, incoordination, vertigo, depression,  
 (15) anxiety, mental confusion, polyneuritis and so on,  
 (16) they're all listed, they're listed here, and so  
 (17) those -  
 (18) Q. So when you say - I guess what I'm getting  
 (19) at is when you say "the literature" - I'm sorry.  
 (20) A. Right. Well, there are numerous articles in  
 (21) which effects of solvents such as the ones the Casales  
 (22) were exposed to - that these solvents cause various  
 (23) central nervous system effects, which is sort of  
 (24) lumped together and termed toxic encephalopathy, and  
 (25) these consist of, you know, memory disturbances,

## Page 155

(1) effects on concentration, personality changes,  
 (2) sleep disturbances, olfactory disturbances, dizziness,  
 (3) et cetera, et cetera.  
 (4) Q. When you say "numerous articles," can you  
 (5) refer me to any specific articles or treatises?  
 (6) A. Yeah, I mean, they've got a whole - you  
 (7) know, a whole bunch in here, and I could - you know,  
 (8) I could cite a number of - let's see. Okay. Here,  
 (9) for example, in this book, this Soborg, Solvent  
 (10) Neurotoxicity, chronic effects of toluene in humans,  
 (11) memory impairment, long lasting depression, vestibular

## NOTES

(12) dysfunction, means dizziness, psychomotor function,  
 (13) encephalopathy, behavioral effect, so on.  
 (14) Q. Maybe I can make it easier by doing this  
 (15) way, Doctor. You've got all the - would it be fair  
 (16) to say that the books you've pulled here and sources  
 (17) cited in them would be the type of literature you're  
 (18) talking about?  
 (19) A. Exactly.  
 (20) Q. Okay. I think now's as good a time as any.  
 (21) Let me read the names of the books into the record  
 (22) real quick so that we can find these.  
 (23) MR. FUERST: If you'd like for me to have  
 (24) like the cover of those books copied, maybe that would  
 (25) be easier.

## Page 156

(1) MR. JORDAN: The cover and just wherever it  
 (2) says what year it was published or who published it so  
 (3) we can find them. That would be great. Then we can  
 (4) avoid that.  
 (5) MR. FUERST: Let's go off the record a  
 (6) second.  
 (7) MR. JORDAN: Sure.  
 (8) [Recess]  
 (9) [Exhibit 5 marked, page 253 of the book  
 (10) Environment and Health]  
 (11) MR. JORDAN: Just for the record, I'm  
 (12) attaching Exhibit 5, a page from, I believe,  
 (13) Dr. Trieff's book, page 253 he referred to earlier,  
 (14) for references 46 and 47 on that page. And that's  
 (15) earlier in the deposition. And we're having copied  
 (16) some of the treatises you relied upon in coming to the  
 (17) opinion that the symptoms of the Casales were related  
 (18) to their exposure to the chemicals and substances  
 (19) cited in the affidavit.  
 (20) Q. Let me come back to this. Bear with me for

- (21) a second. Can you tell us - and again, I'm going to  
 (22) be working with you on Exhibit 4. Can you tell us  
 (23) what the specific biomarkers for each one of - for  
 (24) each one of the chemicals you're talking about on  
 (25) Exhibit 4 would be that would indicate exposure to

Page 157

- (1) that chemical?  
 (2) A. Indicate exposure or effect? There are two  
 (3) different kinds of biomarkers, actually.  
 (4) Q. Are there?  
 (5) A. One is - yeah, well, really three different  
 (6) kinds, exposure, effect and susceptibility, three  
 (7) different kinds.  
 (8) Q. How about this, if we went through each one  
 (9) of them, could you tell me what the - I mean, and  
 (10) I'll just let you go through them and say cyclohexane,  
 (11) here's the biomarkers for exposure, here's the  
 (12) biomarkers for effect, here's the biomarkers for  
 (13) susceptibility. I mean, could you do that for me?  
 (14) A. I could do it in general. I mean, I'd have  
 (15) to - there are a few that I happen to know, but in  
 (16) most cases I would just be guessing, and I would  
 (17) prefer not to do that. So if I could give you the  
 (18) general principles and a couple of examples, I  
 (19) think - if that would satisfy you -  
 (20) Q. Okay. And I just want to - you may not  
 (21) even have to do that. Is it fair to say that as  
 (22) you sit here if I were to ask you to give me the  
 (23) biomarkers for any of the chemicals in Exhibit 4,  
 (24) you would pretty much be guessing?  
 (25) A. Well, there are some that I could, but I

Page 158

- (1) just wanted to explain, you know, what kinds of  
 (2) biomarkers there would be and, you

# NOTES

- know, what the  
 (3) problems were.  
 (4) Q. Okay. Well, how about this -  
 (5) A. Yeah.  
 (6) Q. And again, I want to save us all time, so  
 (7) what I'm thinking is maybe the way to do it is to  
 (8) say pick out the ones on Exhibit 4 that you know you  
 (9) can tell us as we sit here what the biomarkers are  
 (10) and tell me what those are, and then the ones that  
 (11) you can't, we'll just say that you can't tell me  
 (12) what the biomarkers are as you sit here. Okay?  
 (13) A. Fine. Benzene is probably one of the classic  
 (14) cases, and it's metabolized to phenol, so that phenol  
 (15) is excreted in the urine. And so a measurement of  
 (16) phenol is an indication of exposure to benzene. So  
 (17) that measures exposure of benzene.  
 (18) Q. Okay.  
 (19) A. Now, the whole - and then other of the  
 (20) chemicals would have their - whatever particular  
 (21) metabolites they are transformed to being in the  
 (22) urine. In other words, what you look at, the  
 (23) biomarker of exposure is usually some metabolite, or  
 (24) it can be the original compound which you could do an  
 (25) analysis on, like in the - either in the blood or the

Page 159

- (1) urine. Usually urine it's simpler and less invasive.  
 (2) Q. Maybe we could break it down that way.  
 (3) A. Yeah.  
 (4) Q. Tell me which ones of these chemicals you  
 (5) can tell me what the biomarkers for exposure are.  
 (6) A. Well, I said benzene would be phenol.  
 (7) Q. Okay.  
 (8) A. And others I would - I probably would have  
 (9) to guess on.  
 (10) Q. Okay. So you wouldn't want to do

that?

(11) A. Yeah.

(12) Q. Okay.

(13) A. Not particularly.

(14) Q. What about which ones - I understand. Which

(15) ones on this list, Exhibit 4, could you tell us the

(16) biomarkers for effect are?

(17) A. Okay. The biomarkers for effect, like for

(18) this nervous system effects, would use a whole - a

(19) battery of tests. In other words, like if it was to

(20) humans, they could use - a battery of tests would be

(21) used, and the scores on those tests would indicate -

(22) would indicate the effect.

(23) So there are laboratories, for example, which

(24) are studying, you know, performance and the effect of

(25) chemicals or drugs on performance, and then they just

#### Page 160

(1) do a whole battery of tests on controls and those

(2) exposed, and they come out with some number.

(3) Q. Yeah, and presumably that laboratory test

(4) would come up with an effect or not an effect -

(5) A. Right.

(6) Q. - one way or the other?

(7) A. Or a degree. The effect could be graded,

(8) could be a big effect or a slight effect.

(9) Q. Okay. And can you tell me for any of

(10) these particular chemicals on 4 what the particular

(11) biomarker of effect for that would be?

(12) A. Well, as I say, they have a whole - there's

(13) a whole battery of tests, and they're all pretty much

(14) the same. I mean, they may vary from lab to lab, but

(15) you would do - basically do the whole battery of

(16) tests on the compounds.

(17) Q. Are the tests themselves considered, I'm

(18) sorry, biomarkers? Are the tests themselves

(19) biomarkers?

#### NOTES

(20) A. Yes, they are, because they indicate the

(21) effect of the chemical on exposure - I mean, they

(22) indicate the effect of the chemical on performance

(23) of some sort, psychological performance. So, for

(24) example, there would be one effect where you're

(25) doing - testing memory for numbers, test -

#### Page 161

(1) determining IQ, doing other kinds of tests, you

(2) know, the -

(3) Q. I was about to -

(4) A. - manual dexterity and stuff like that.

(5) Q. I think you were kind of anticipating my

(6) question, because I was going to ask you if you can

(7) tell us what those tests are.

(8) A. Yeah, well, those would be it.

(9) Q. Like standard IQ tests?

(10) A. Standard IQ, memory for numbers, some kind

(11) of manual dexterity test or tests.

(12) Q. Okay. And you don't know - off your head.

(13) you don't know like the specific names, like whatever,

(14) Johnson test or this test or that?

(15) A. Not offhand. Well, some of them don't - you

(16) know, may not have names, others may.

(17) Q. Okay. And that battery of tests, is that

(18) applicable to all of the drugs we're talking about on

(19) Exhibit 4 or just -

(20) A. It would be applicable to all. You know,

(21) some labs use a different battery than others.

(22) Q. Okay. It sounds to me - and I want to see

(23) if I can summarize this so that it makes sense to me.

(24) A. Yeah.

(25) Q. And it sounds as though when you're looking

#### Page 162

(1) at biomarkers for - biomarkers for effect, and we can

(2) talk about this in a second -

(3) A. Yeah, right.

(4) Q. Biomarkers for effect in any of these  
 (5) chemicals in Exhibit 4, there's a battery of tests  
 (6) that you've been speaking about that would be the  
 (7) biomarkers for that?  
 (8) A. Yeah, exactly.  
 (9) Q. Okay. Let me ask you this. What about the  
 (10) biomarkers of susceptibility, can you tell us about  
 (11) the biomarkers for susceptibility of any of these  
 (12) chemicals on Exhibit 4?  
 (13) A. Well, I can in this - you know, for this  
 (14) particular group looking at neural effects, but an  
 (15) example of that susceptibility would be, you know,  
 (16) comparing the susceptibility of two individuals, say,  
 (17) in their reaction to a particular compound, such as -  
 (18) such as respiratory problems. Some individuals have  
 (19) a reduced level of some enzyme in the blood which  
 (20) makes them more susceptible to pulmonary problems.  
 (21) So that - I mean, that would be an example of that.  
 (22) And, you know, I don't know offhand which  
 (23) ones would be suitable for the neurotoxicological, but  
 (24) that's what it would be. It would be the presence or  
 (25) absence of some enzyme or some hormone that might make

Page 163

(1) one person's response different from another.  
 (2) Q. Okay. I guess what I'm getting at here is  
 (3) that, you know, there's a whole - I know it's a long  
 (4) list of chemicals, but it seems to me that I think you  
 (5) would agree that biomarkers of susceptibility do have  
 (6) a significance for someone's exposure, don't they?  
 (7) A. Yes, they do.  
 (8) Q. And that's why I'm just trying to see if you  
 (9) can tell me, specifically for these particular

# NOTES

(10) chemicals, because it may be significant in this case,  
 (11) if there are particular biomarkers of susceptibility  
 (12) for these chemicals.  
 (13) A. Well, no doubt there may be, but I - you  
 (14) know -  
 (15) Q. And if you can't tell me as you sit here  
 (16) today, I mean, that's fine. That's all I'm trying to  
 (17) find out.  
 (18) A. I don't know - in these specific cases, I  
 (19) don't know which biomarkers would be suitable for  
 (20) susceptibility.  
 (21) Q. Okay. All right. That's fine. This is a  
 (22) question that I'm again going to apply to all these  
 (23) chemicals that are on Exhibit 4. Are there any of  
 (24) these that are normally found in an indoor  
 (25) environment?

Page 164

(1) A. Yes.  
 (2) Q. Can you tell me which ones are normally found  
 (3) in an indoor environment?  
 (4) A. You may have, you know, traces of a number  
 (5) of them, for example, from - like from fabrics,  
 (6) stuff like that, but offhand, I couldn't tell you  
 (7) which ones, but -  
 (8) Q. And that's what I was hoping you could do.  
 (9) is take a look just at the list, those three pages,  
 (10) and say whatever, chloroform -  
 (11) A. Chloroform might be present, because it's  
 (12) present - it's present in the ambient air, you know,  
 (13) very small amounts of it are present. Carbon tet  
 (14) might be present, a very small amount of that.  
 (15) Probably have some small amounts of benzene, toluene,  
 (16) maybe hexane, you know, from gasoline and other  
 (17) petroleum products, and probably some others. This  
 (18) would require, obviously, an analysis.

Diesel fuel -

(19) Q. And, actually, what I'm doing is I'm drawing

(20) on your experience with these chemicals.

(21) A. Yeah.

(22) Q. And you've listed a bunch. And when you say

(23) "carbon tet," by the way, what is the full name of

(24) that?

(25) A. Carbon tetrachloride, CCl<sub>4</sub>.

Page 165

(1) Q. And you've just mentioned a number.

(2) A. And ethyl benzene.

(3) Q. If I'm understanding you, you're saying there

(4) might be trace amounts in an indoor environment?

(5) A. Right.

(6) Q. Are there any others that you think there may

(7) be trace amounts in a normal indoor environment?

(8) A. Oh, ethyl benzene, maybe N-butanol, acetylene

(9) perhaps, maybe some cumene, maybe, perhaps,

(10) methylchloroform, trichloroethylene, I don't know.

(11) We - we've actually - you would have to do trace

(12) analyses, and, of course, that's easier said than

(13) done.

(14) Q. I see. It sounds like those are all the ones

(15) just from looking at the list or from looking at these

(16) chemicals that you would say as you sit here today

(17) might be in a normal indoor environment.

(18) A. Yeah, and an outdoor environment, too.

(19) Q. Either indoor or outdoor -

(20) A. Right.

(21) Q. - it would be normal to see these chemicals?

(22) A. Some contaminants might be more present to a

(23) greater degree indoors, others to a greater degree

(24) outdoors.

(25) Q. But I guess it's normal to encounter them.

Page 166

(1) though?

## NOTES

(2) A. Yes.

(3) Q. And the - is there anything you can say

(4) about what normal concentrations you might see or -

(5) A. The normal concentrations, what you're

(6) talking about is background concentrations, and they,

(7) in general, would be a lot lower than when there was

(8) some source for pollution. So they might be a

(9) thousand or maybe a hundred thousand times lower than

(10) what there is by some source which is generating

(11) pollutants, so either an industrial source or toxic

(12) waste source or some other operation.

(13) Q. Okay. All right. I want to just come back

(14) to the health problems of the Casales and talk about

(15) them. We talked about earlier about some of the -

(16) what are known as confounders or other potential

(17) causes.

(18) A. Yes.

(19) Q. And I want to see if - I just want to go

(20) through some of these. We started with the problem of

(21) sleep loss. Would you agree with me that some other

(22) potential causes of that are drug side effects?

(23) A. Yes.

(24) Q. Stress?

(25) A. Yes.

Page 167

(1) Q. Lack of exercise?

(2) A. Yes.

(3) Q. Alcohol withdrawal syndrome?

(4) A. Yes.

(5) Q. Nocturnal myoclonus?

(6) A. I don't know what that is.

(7) Q. Myoclonus, I should say.

(8) A. I'm not sure I know what that is.

(9) Q. Pain?

(10) A. Sure.

(11) Q. Thyroid problems?

(12) A. Probably.

(13) Q. Depression?

(14) A. Yeah.

(15) Q. Okay.

(16) A. I might just say that the

depression, that

(17) with regard to the depression, depression might be a

(18) direct effect from the exposures, too. In one of

(19) these books they referred to a post-traumatic stress

(20) disorder, which includes depression.

(21) Q. Well, I take it in order to rule out some

(22) of the - any of these other potential causes, you

(23) would need to have seen the medical records?

(24) A. Yes.

(25) Q. And without seeing them, is there anything

#### Page 168

(1) else you did or could have done to rule out other

(2) causes?

(3) A. I don't think so.

(4) Q. Let me hit loss of smell very quickly.

(5) A. Okay. Loss of smell -

(6) Q. Could you tell me what other potential -

(7) A. This - sometimes this - you know, could

(8) be - well, you know, it depends on, of course, when

(9) she lost the sense of smell.

Assuming it -

(10) temporally it fits in the with exposure, then I don't

(11) know. About the only other things I could think of

(12) might be some kind of an endocrine - some kind of

(13) endocrine problem or -

(14) Q. Diabetes?

(15) A. Yeah, maybe, possibly. I don't know. In

(16) some cases some dietary inadequacies, but solvents

(17) are well known to cause loss of smell.

(18) Q. Okay. Would it be fair to say for all the

(19) different problems, including the liver problems and

(20) skin irritation and all that, in order to rule out

(21) other causes, you would need to see the medical

(22) records of the Casales?

(23) A. Yeah, I mean, for example, you would

(24) obviously want to ensure that she - Ms. Casale

#### NOTES

(25) did not have hepatitis, for example, with the

#### Page 169

(1) liver problems. Yeah, right.

(2) Q. And if she had - if the medical information

(3) showed that she had liver problems predating Hercules'

(4) operation in 1989 -

(5) A. This means - what this means then is the

(6) condition started prior to the exposures, but the

(7) exposures could have exacerbated them. On the other

(8) hand, if she had - if she didn't have the exposures

(9) [sic], then it's likely that the exposures caused it.

(10) Q. And that's what I'm getting at. It's just

(11) that - I asked you this a little bit earlier, and I'm

(12) coming back to it just because I wasn't sure I

(13) understood what your answer was - is the things you

(14) did to rule out for each one of these, and it's a

(15) number of ailments that you did or were able to do in

(16) order to rule out potential causes.

(17) A. And I think we discussed that, and what -

(18) you know, what I said was that I would, you know,

(19) obviously consider other causes, but I would have

(20) to have information to - you know, in order to rule

(21) them in or out.

(22) Q. Okay. Did you request their medical records

(23) and they just haven't gotten them to you or -

(24) A. I believe I did request them.

(25) Q. Okay.

#### Page 170

(1) A. And -

(2) Q. All right. Is there any other information

(3) that would have been helpful to you in ruling out

(4) other causes other than medical records?

(5) A. Well, of course, I - we mentioned family

(6) history.

(7) Q. And life-style, we talked about that.

## NOTES

(8) A. I guess that's it, pretty much.  
 (9) Q. Is it fair to say that for most, if not all,  
 (10) of the ailments, and I could go through them one by  
 (11) one, but for most, if not all, of them, particularly  
 (12) with regard to Mrs. Casale, they could have been  
 (13) caused by side effects of drugs, of the medication she  
 (14) was taking?  
 (15) A. I'd have to look at - let's see. Okay.  
 (16) Okay. From her affidavit, right?  
 (17) Q. Uh-huh.  
 (18) A. Okay. Like, for example, she said she was  
 (19) having headaches. There are - of course, there are  
 (20) other causes of headaches. She wasn't - she doesn't  
 (21) say she was taking drugs at the time she was getting  
 (22) headaches, so unless - you know, headaches can be  
 (23) caused by a number of factors. Obviously, there are  
 (24) other factors than the chemicals, but the chemicals  
 (25) could be a contributing or exacerbating factor or a

## Page 171

(1) sole causative factor. It's hard to know.  
 (2) MR. JORDAN: Okay. Why don't we take a quick  
 (3) break, and I'll be able to finish up.  
 (4) [Recess]  
 (5) MR. JORDAN:  
 (6) Q. Doctor, let me tell you what I was getting  
 (7) at a little bit earlier. We've got a lot of medical  
 (8) records, particularly on Mrs. Casale, and this woman  
 (9) apparently was on quite a bit of medications, and what  
 (10) I want to ask you about very quickly is with regard to  
 (11) some of her symptoms of some of her medications and  
 (12) see if I can get an opinion from you.  
 (13) Let me start with the fact that she said  
 (14) she's had a cough that you've related as caused by the  
 (15) exposure. She was on, I can represent to you, five

(16) drugs, Accupril, Pilosec, Ru-Tuss, Synalgos, that's  
 (17) S-y-n-a-l-g-o-s, DC, and Trinalin, all of which  
 (18) apparently have side effects that cause people  
 (19) coughing problems. Would you agree with me that it's  
 (20) possible that her coughing problems were caused by  
 (21) side effects of those drugs and not by exposure to  
 (22) chemicals?  
 (23) A. Yeah, it's possible. I would want to know,  
 (24) you know, why she was taking all of these. In other  
 (25) words, was she taking the drugs to - because she had

## Page 172

(1) a coughing problem, or was she taking them for other  
 (2) reasons or what? So -  
 (3) Q. Okay. The skin irritation problem, there's  
 (4) probably a number you may have noted earlier she was  
 (5) on, Accupril, Ansaad, Augmentin, Cefitin, Cefzil,  
 (6) flurazepam, Hydrocet, Lortab, Motrin, Mylicon,  
 (7) Naprosyn, Oradol DM, Orudis, Pilosec, Robitussin-DAC,  
 (8) Synalgos DC, Tagamet, Tussi, that's T-u-s-s-i, R-Gen  
 (9) DM, Tylenol and Vicodin, all of which apparently have  
 (10) side effects of skin irritation. And I guess what I'm  
 (11) getting at is if somebody is taking that many drugs  
 (12) that have a side effect of skin irritation, isn't that  
 (13) a plausible explanation for their problem as opposed  
 (14) to being exposed to chemicals?  
 (15) A. Yeah, or in addition to.  
 (16) Q. The liver problem, it's the same thing.  
 (17) Accupril - she's on Accupril, amoxicillin, amoxil,  
 (18) Ansaad, Augmentin, Cefitin, Cefzil, Darvocet,  
 (19) Depo-Medrol, Marcaine, erythromycin, flurazepam,  
 (20) Halopane, Librax, Mylicon and Tagamet, apparently  
 (21) all of which are associated with liver problems -

- (22) MR. FUERST: Hold on a second, Dr. Trieff.  
 (23) Are you representing to Dr. Trieff that Stella Casale  
 (24) was on all of those drugs at the same time?  
 (25) MR. JORDAN:

Page 173

- (1) Q. No, these are drugs that her medical records  
 (2) have shown us that she was on at one time or another,  
 (3) and I'm not representing to you that she was on any of  
 (4) these drugs continuously. I'm saying at some point or  
 (5) another her medical records indicate she took these  
 (6) drugs. Do you understand what I'm saying?  
 (7) A. Right. And, of course, she was exposed to a  
 (8) number of chemicals that cause severe liver problems,  
 (9) including carbon tetrachloride, chloroform, ethanol,  
 (10) butanol, propanol, trichloroethylene, methylchloroform  
 (11) and so on, so that - I mean, I'm not arguing that  
 (12) one or more of the drugs did not contribute, but I'm  
 (13) saying that the chemicals must be very high or the  
 (14) highest on the list in terms of liver problems. I  
 (15) mean, because these are some really bad actors.  
 (16) Almost anyone that's exposed to carbon tetrachloride  
 (17) is going to - and especially with alcohol, is going  
 (18) to have liver problems.

- (19) Q. And I guess that's what I'm getting at. I  
 (20) know you weren't aware she was on a lot of these  
 (21) drugs.  
 (22) A. Yes.  
 (23) Q. And I understand you feel like the chemicals  
 (24) may have something to do with it. What I'm saying is  
 (25) from a causation-of-her-problems perspective, is there

Page 174

- (1) any way you can be sure, hearing that she's on all  
 (2) these medications, that the exposure

# NOTES

- to the chemicals  
 (3) is more than 51 percent responsible as opposed to all  
 (4) the medications she was taking?  
 (5) A. Well, you would have to - you know, you  
 (6) would have to examine in each case what the - what  
 (7) drugs she was on at which particular time and what  
 (8) the side effects were and -  
 (9) Q. So it's not really a clear-cut causation  
 (10) problem for a lot of these ailments?  
 (11) A. Well, it's, of course, very complicated,  
 (12) especially if someone is on medication that may  
 (13) cause - that could cause some of the same problems  
 (14) that the chemicals are causing. And it's just like,  
 (15) you know, as I mentioned, it's a case of smoking and  
 (16) asbestos. You can't say that the smoking caused the  
 (17) lung cancer and the asbestos didn't and vice versa.  
 (18) They both caused it.  
 (19) Q. Right. Exactly.  
 (20) A. So the best assumption you can make is in  
 (21) each individual case establish when she was taking  
 (22) what and when the particular exposures were and  
 (23) then - and apportion it, so you could say that say  
 (24) 60 percent, 60 or 70 percent is from the chemicals,  
 (25) 20, 30 percent is from the drugs and so on, you know.

Page 175

- (1) Q. And in doing - is there any way to be able  
 (2) to do that apportionment scientifically?  
 (3) A. It's very - you have to make a lot of  
 (4) assumptions and, you know, it's hard to do and it's  
 (5) a lot of - obviously, we talked about the lack of  
 (6) information on levels -  
 (7) Q. I mean, in other words, I guess what I'm  
 (8) getting at, she told you she had nausea and vomiting.  
 (9) A. Right.

## NOTES

(10) Q. And nausea and vomiting, she said to you that  
 (11) happened because - after they were doing this.  
 (12) A. Yes.  
 (13) Q. And I'm asking you did go she ever mention to  
 (14) you that she had been on 27 different medications that  
 (15) had side effects of nausea and vomiting or a large  
 (16) number of medications that had that side effect?  
 (17) A. No, I didn't know she was taking all of the  
 (18) drugs that -  
 (19) Q. And again, I'm not saying she's taking them  
 (20) continuously. I'm saying that over time she's taken a  
 (21) number of different -  
 (22) A. Yeah.  
 (23) Q. Doctor, you've been probably doing this for  
 (24) a long time. How long have you been involved in  
 (25) testifying in lawsuits?

Page 176

(1) A. Well, I think it's about 20 years now, since  
 (2) about 1978, something like that.  
 (3) Q. Okay. Has that always been in the fashion in  
 (4) which you're in this case, that you're retained by  
 (5) attorney -  
 (6) A. Plaintiff or - oh -  
 (7) Q. In other words, sometimes a doctor is a  
 (8) treating or he's just a lab technician, he gets  
 (9) subpoenaed just because he looks at something, as  
 (10) opposed to attorney saying hey, I'd like you to  
 (11) look at this and retain you.  
 (12) A. Oh, no, in some cases I'm just a consultant  
 (13) on the case, yeah.  
 (14) Q. Well, let me ask you, in the 20 years you've  
 (15) been doing it, what percentage of your work is like  
 (16) this, being retained by attorneys?  
 (17) A. As opposed to just a consultant, being called  
 (18) as a consultant or -  
 (19) Q. How about this, what percentage of your work

(20) do you work as a consulting or testifying expert?  
 (21) A. Of my work total?  
 (22) Q. Yeah.  
 (23) A. Oh, well, I mean, majority of my work is at  
 (24) UTMB, so I would say, I don't know, 10 or 15 percent,  
 (25) something like that.

Page 177

(1) Q. Okay. Of the consulting work that you do in  
 (2) lawsuits, how much is for plaintiff versus defendant?  
 (3) A. It's about - over the years, probably about  
 (4) 90 percent plaintiff, about five or 10 percent for the  
 (5) defense.  
 (6) Q. Okay. Would that be - would that figure be  
 (7) the same for like the last 10 years, has it been 90  
 (8) percent plaintiff?  
 (9) A. Well, it's definitely a majority for the  
 (10) plaintiff. There have been a few defense attorneys  
 (11) that have contacted me, and I've, you know, done - in  
 (12) most cases I've just done consulting for them.  
 (13) Q. I understand. Have you worked for this firm  
 (14) before?  
 (15) A. Yes.  
 (16) Q. Okay. How often have you worked for this  
 (17) firm before?  
 (18) A. I was talking with John McDowell, and I  
 (19) thought it was once before, some case with Lubrizol.  
 (20) He thought it was several times, so -  
 (21) MR. FUERST: John said that?  
 (22) THE WITNESS: Yeah, but I think maybe it was  
 (23) a class action suit. Maybe that was the - I guess  
 (24) two different cases.  
 (25) MR. JORDAN:

Page 178

(1) Q. I know how that is. Okay. Let me try and  
 (2) really wrap this up. Is there anything else other  
 (3) than what's in this affidavit, any other chemical, any  
 (4) other substance, any other noise or anything else that

- (5) you think caused the Casales' problems, that hurt
- (6) them?
- (7) A. No, I - well, these are the chemicals in -
- (8) I don't know, was this Exhibit 4?
- (9) Q. Yeah, it's Exhibit 4. I understand. It's
- (10) mentioned in your affidavit.
- (11) A. Yes.
- (12) Q. Other than what's in your affidavit and
- (13) Exhibit 4 -
- (14) A. No.
- (15) Q. No?
- (16) A. No, not that I'm aware of, unless I get a
- (17) modified list of compounds that were exhausted to the
- (18) atmosphere.
- (19) Q. Okay. Yeah, I asked you earlier about this.
- (20) and you - and I wasn't sure if you said yes or no.
- (21) Do you plan to do a revised affidavit or revised
- (22) report? Is that something you -
- (23) A. If I'm asked to do it, you know, I will.
- (24) Q. Okay. Obviously, I'll ask if he does, we
- (25) find out about it.

Page 179

- (1) MR. FUERST: Extremely dependent upon what
- (2) you guys do.
- (3) MR. JORDAN: Let me go off the record for
- (4) just one second.
- (5) [Discussion off the record]
- (6) [Exhibit 6, copies of cover and publication
- (7) information page of eight books]
- (8) MR. JORDAN:
- (9) Q. Doctor, just so you know, we're attaching as
- (10) Exhibit 6 copies of the front page, et cetera, of
- (11) the books you had mentioned earlier you got from the
- (12) library or that you had that you've relied upon.
- (13) A. Yes.
- (14) Q. And I want to ask you about that. Have we
- (15) discussed all of the different materials that you can
- (16) remember reviewing specifically with regard to this

## NOTES

- (17) case?
- (18) A. We have.
- (19) Q. Okay. And those would include these
- (20) documents that are attached as Exhibit 6 as well
- (21) as the other things we've discussed during the
- (22) deposition?
- (23) A. Correct.
- (24) Q. And other than that, you've relied upon your
- (25) own experience?

Page 180

- (1) A. Yes.
- (2) [Exhibit 7 marked, draft of Trieff affidavit
- (3) with fax cover]
- (4) MR. JORDAN: Okay. Doctor, we're also
- (5) attaching as Exhibit No. 7 the prior draft of your
- (6) affidavit, and it looks as though the only changes
- (7) are typographical. Let me take a quick look at this
- (8) off the record, and then we'll just finish up.
- (9) [Discussion off the record]
- (10) MR. JORDAN:
- (11) Q. Doctor, I think, unless you wind up giving us
- (12) for whatever reason a revised affidavit or report, is
- (13) there anything else you feel like I didn't cover with
- (14) you that's significant?
- (15) A. No, I think you have.
- (16) MR. JORDAN: Okay. All right.
- (17) MR. FUERST: We will reserve our questions
- (18) until the time of trial.
- (19) \_\_\_\_\_
- (20)
- (21)
- (22)
- (23)
- (24)
- (25)

Page 181

- (1) SIGNATURE OF WITNESS
- (2)
- (3) I, Norman Trieff, Ph.D., solemnly swear or
- (4) affirm, under the pains and penalties of perjury, that
- (5) the foregoing contains a true and correct transcript
- (6) of the testimony given by me at the

time and place

(7) stated, with changes, if any, and the reasons therefor

(8) noted on a separate sheet of paper and attached

(9) hereto, and that I am signing this before a Notary

(10) Public.

(11)

(12)

(13) Norman Trieff, Ph.D.

(14)

(15)

(16) THE STATE OF TEXAS]

(17)

(18) Subscribed and sworn or affirmed to before

(19) me, the undersigned authority, by Norman Trieff, Ph.D.

(20) On this the            day of

(21)

(22)

(23) Notary Public in and for

(24) the State of Texas

(25)

Page 182

(1) STATE OF TEXAS]

(2)

(3) COURT REPORTER'S CERTIFICATE

(4)

(5) I, Shawn Kelley, a Certified Shorthand

(6) Reporter within and for the State of Texas, hereby

(7) certify that the foregoing proceedings occurred

(8) before me.

(9) I further certify that the foregoing is

(10) a true and correct copy of the transcript of the

(11) proceedings to the best of my ability.

(12) I further certify that I am neither

(13) attorney for, related to nor employed by any of

(14) the parties or any attorney of record in this cause,

(15) nor do I have a financial interest in the matter.

(16) Witness my hand April 19, 1998.

(17)

(18)

(19)

(20) Shawn Kelley, Texas CSR 3448\*

(21) Neil McCallum & Associates

(22) 5300 Memorial, Suite 600

(23) Houston, Texas 77007

(24) (713) 523-3767

(25) \*My Certificate Expires December 31, 1999

# NOTES

Page 183

(1) THE STATE OF TEXAS] COURT REPORTER'S CERTIFICATE

(2) No. 96-G-0201

(3)

HERCULES MARINE SERVICES ]  
IN THE DISTRICT COURT OF

(4) CORPORATION ]

]

(5) v. ] BRAZORIA COUNTY, TEXAS

]

(6) BOB CASALE ] 239TH JUDICIAL DISTRICT

(7)

(8)

(9) DEPOSITION OF

(10)

(11) NORMAN TRIEFF, Ph.D.

(12)

(13) April 14, 1998

(14) 1301 McKinney, Suite 3700

(15) Houston, Texas

(16)

(17) Taxable Cost: \$

(18) Charged to Sean Jordan, State Bar No.

(19) Attorney for Plaintiff

(20)

(21) Shawn Kelley, CSR No. 3448

(22) Neil McCallum & Associates Inc.

(23) 5300 Memorial, Suite 600

(24) Houston, Texas 77007

(25) (713) 523-3767

Page 184

(1) I, Shawn Kelley, Certified Shorthand  
(2) Reporter, being neither attorney for, related

(3) to nor employed by any of the parties or any attorneys

(4) of record in this cause, and having no financial

(5) interest in the matter, hereby certify pursuant to

(6) the Texas Rules of Civil Procedure, Rule 206:

(7) i. That the witness was duly sworn or

(8) affirmed by me;

(9) ii. That this transcript is a true record

(10) of the testimony given by the witness;

(11) iii. That the charges for preparation

(12) of the completed transcript and any copies of

(13) exhibits are as stated;

(14) iv. That the deposition transcript

(15) was submitted to the witness or to the attorney

(16) of record for a party who was the witness, for

- (17) examination, signature and return to me within  
 (18) 20 days;  
 (19) v. That changes, if any, made by the witness  
 (20) in the transcript and otherwise are attached hereto  
 (21) or incorporated herein;  
 (22) vi. That the witness ( ) did ( ) did  
 (23) not return the transcript or corrections within  
 (24) 20 days;  
 (25) vii. That the original deposition

## Page 185

- (1) transcript, or a copy thereof in the event the  
 (2) original was not returned to me, together with  
 (3) copies of all exhibits, was delivered or mailed  
 (4) in a postage-paid, properly-addressed wrapper,  
 (5) certified with return receipt requested, for  
 (6) safekeeping and use at trial and hearings, to  
 (7) the attorney or party who asked the first  
 (8) question appearing in the transcript, to-wit:  
 (9)  
 (10) Sean Jordan  
 (11) Attorney at Law  
 (12) Beime, Maynard & Parsons, LLP.  
 (13) 1300 Post Oak Boulevard, 25th Floor  
 (14) Houston, Texas 77056  
 (15)  
 (16) viii. That pursuant to Texas Rules of  
 (17) Civil Procedure 21a, a copy of this certificate  
 (18) was served on all parties made known to me, to-wit:  
 (19)  
 (20) Michael Fuerst  
 (21) Attorney at Law  
 (22) McDowell Collmer, LLP.  
 (23) 1301 McKinney, Suite 3700  
 (24) Houston, Texas 77010  
 (25)

## Page 186

- (1) Witness my hand on  
 (2) 1998.  
 (3)  
 (4)  
 (5) Shawn Kelley, Texas CSR 3448\*  
 (6) Nell McCallum & Associates  
 (7) 5300 Memorial, Suite 600  
 (8) Houston, Texas 77007

## NOTES

- (9) (713) 523-3767  
 (10)  
 (11) \*My Certificate Expires December 31, 1999  
 (12)  
 (13)  
 (14)  
 (15)  
 (16)  
 (17)  
 (18)  
 (19)  
 (20)  
 (21)  
 (22)  
 (23)  
 (24)  
 (25)

## Page 187

- (1) INDEX  
 (2)  
 (3) EXAMINATION BY MR. JORDAN..... 3  
 (4)  
 (5)  
 (6) [Exhibit 1 marked, Trieff curriculum vitae]..... 29  
 (7)  
 (8) [Exhibit 2 marked, notice of deposition with  
 (9) subpoena duces tecum]..... 29  
 (10)  
 (11) [Exhibit 3 marked, fax from Eggleston to Trieff,  
 (12) dated 4-8-98, with enclosed Chronology of Barges  
 (13) Serviced by Hercules]..... 31  
 (14)  
 (15) [Exhibit 4 marked, Dr. Trieff's handwritten list  
 (16) of chemicals and organic compounds]..... 76  
 (17)  
 (18) [Exhibit 5 marked, page 253 of the book  
 (19) Environment and Health]..... 156  
 (20)  
 (21) [Exhibit 6, copies of cover and publication  
 (22) information page of eight books]..... 179  
 (23)  
 (24) [Exhibit 7 marked, draft of Trieff affidavit  
 (25) with fax cover]..... 180

**Look-See Concordance Report**

UNIQUE WORDS: 1,962  
TOTAL OCCURRENCES: 9,231  
NOISE WORDS: 385  
TOTAL WORDS IN FILE: 32,742

**SINGLE FILE CONCORDANCE****CASE SENSITIVE**

NOISE WORD LIST(S): NOISE.NOI

INCLUDES ALL TEXT OCCURRENCES

IGNORES PURE NUMBERS

WORD RANGES @ BOTTOM OF PAGE

**- 1 -**

10th [1] 121:10  
14th [2] 121:7, 11  
15th [1] 121:8  
16th [3] 121:5, 8, 11

**- 2 -**

21a [1] 185:17  
21st [1] 121:9  
22nd [2] 121:6, 9  
239TH [1] 183:6  
23rd [1] 121:11  
24-hour [2] 144:24; 145:18  
24th [3] 121:6, 7, 9  
25th [1] 185:13  
27th [1] 121:10  
28th [2] 121:7, 10  
29th [1] 121:7

**- 4 -**

4-8-98 [2] 31:7; 187:12  
40-hour [1] 136:24  
4th [1] 14:8

**- 5 -**

523-3767 [3] 182:24; 183:25; 186:9

**- 8 -**

8th [1] 121:11

**- 9 -**

96-G-0201 [1] 183:2

**- A -**

ability [1] 182:11  
able [15] 4:9; 31:24; 33:16; 49:6; 56:9; 57:19;  
73:15; 76:15; 87:17; 104:11, 20; 115:11;  
169:15; 171:3; 175:1  
abrasive [2] 90:16; 111:8  
absence [2] 106:2; 162:25  
absolutely [1] 64:20  
absorbed [8] 107:10, 18, 21, 24, 25; 133:16;  
134:3  
Absorption [1] 107:4  
absorption [6] 107:3, 6, 11, 13; 134:2, 8  
accept [2] 138:1, 7  
accepted [2] 137:22; 138:3

accident [1] 58:15  
according [2] 15:24; 87:8  
account [3] 110:14; 135:17  
Accupril [4] 171:16; 172:5, 17  
accuracy [1] 65:4  
accurate [2] 17:3; 60:24  
acetone [2] 150:4, 6  
acetylene [1] 165:8  
ACGIH [10] 136:6, 9, 15; 138:3, 4; 139:4, 7, 9;  
146:10, 14  
aches [1] 125:15  
acid [1] 152:15  
acknowledged [1] 128:6  
acted [1] 127:19  
action [2] 91:4; 177:23  
activities [4] 24:19, 20; 47:9; 104:3  
actors [1] 173:15  
actual [5] 46:15; 55:4; 79:7; 102:25; 137:18  
Acute [1] 125:21  
acute [3] 97:7, 16; 118:16  
add [2] 22:19, 23  
added [1] 128:8  
adding [1] 103:16  
addition [1] 172:15  
additive [1] 149:3  
additivity [1] 149:21  
address [2] 3:17; 145:8  
Administration [1] 145:25  
administration [1] 107:8  
admit [1] 128:10  
admitted [1] 77:2  
adopted [1] 146:10  
adverse [5] 78:19; 104:12, 22; 137:1; 153:17  
aerosol [1] 111:11  
aerosolized [1] 70:20  
affect [7] 49:16, 18; 51:5, 7; 102:2; 103:13;  
152:12  
affected [2] 23:18; 57:22  
affects [1] 24:24  
affidavit [55] 9:5, 10, 17; 11:4, 12, 19, 20;  
13:25; 20:10, 13; 22:15, 19; 25:13; 31:19, 24;  
32:2, 7; 33:19, 24, 25; 34:3, 9, 12, 16, 23;  
35:7, 11; 37:15, 18, 23; 49:14; 51:12; 87:5;  
111:17; 119:19; 124:16; 127:5, 24; 129:25;  
132:8; 152:23;  
153:11, 13, 16, 20; 156:19; 170:16; 178:3, 10,  
12, 21; 180:2, 6, 12; 187:24  
affidavits [11] 16:10; 18:16; 21:22; 22:10;  
31:2; 34:11; 43:18; 46:21, 24; 49:8; 153:14  
affirm [1] 181:4  
affirmed [3] 3:2; 181:18; 184:8  
afterwards [1] 75:1  
Agency [1] 83:15  
agent [4] 52:25; 53:21; 90:12, 13  
agents [1] 41:17  
agree [29] 52:21; 53:2, 24; 54:2, 4, 12, 15;  
58:15; 62:2; 65:12, 20; 66:4, 17; 68:10, 13, 18,  
20; 104:8, 9; 107:5; 130:25; 137:3, 4; 143:1, 4;  
163:5; 166:21; 171:19  
agreed [1] 94:24  
agreeing [1] 54:5  
Ah [1] 100:24  
ailment [4] 40:9; 81:13; 100:1; 101:12  
ailments [21] 30:21; 45:9; 46:11; 48:10; 49:9,  
13; 50:8; 70:1; 76:1, 4; 97:19; 113:25; 124:3,  
6; 127:25; 128:4, 5, 10; 169:15; 170:10;  
174:10  
air [36] 29:24; 30:1; 55:2; 78:18, 21; 79:2, 15;  
80:8; 82:12, 22, 23; 83:8; 87:22; 89:5, 18;  
91:3, 13; 112:3; 113:2; 114:21; 115:4; 131:18,  
24; 133:8, 12; 138:18; 140:20, 24; 141:1, 5, 7,

16; 142:9, 20; 164:12  
al [1] 94:8  
Alcohol [1] 167:3  
alcohol [3] 48:5; 65:25; 173:17  
alcohols [1] 151:1  
allergic [1] 88:23  
allow [2] 137:10; 144:13  
allowed [1] 137:16  
alone [1] 77:16  
alternative [1] 40:22  
alveolar [1] 91:1  
ambient [9] 81:5; 82:12, 23; 83:8; 142:9, 16,  
20; 145:12; 164:12  
American [1] 136:1  
amongst [1] 10:7  
amount [19] 12:17; 28:7, 9, 15, 18, 20, 21, 25;  
29:1, 2; 55:5; 56:21; 80:7; 105:14; 107:7;  
133:13; 134:2; 137:15; 164:14  
amounts [5] 141:25; 164:13, 15; 165:4, 7  
amoxicillin [1] 172:17  
amoxil [1] 172:17  
ampicillin [1] 128:22  
analgesic [2] 99:17; 100:14  
analyses [1] 165:12  
analysis [17] 6:5, 9; 7:20; 8:22; 9:13; 29:24;  
40:21; 47:20; 59:4; 60:4, 11, 15, 18; 63:9;  
69:25; 158:25; 164:18  
analyzed [1] 92:17  
analyzing [1] 95:2  
animal [4] 62:17; 63:14, 16; 68:1  
animals [8] 62:14, 16; 63:8, 23, 25; 64:7;  
68:1; 118:17  
Ann [1] 35:4  
Ansaid [3] 129:9; 172:5, 18  
answer [13] 48:11; 66:10; 71:24; 89:24; 91:10;  
92:4; 93:9, 12; 94:5; 96:4; 101:1; 142:2;  
169:13  
answered [3] 88:8; 106:15; 110:12  
answers [1] 126:24  
antagonistic [3] 151:14; 152:5, 11  
anticipated [1] 12:6  
anticipating [1] 161:5  
antihypertensive [3] 49:25; 50:15, 21  
antiviral [1] 130:14  
anxiety [3] 129:18; 130:21; 154:15  
anybody [2] 11:3, 11  
anyway [4] 10:22; 53:23; 75:3; 84:21  
apologize [1] 136:19  
apparatus [1] 78:14  
Apparently [2] 99:17; 101:24  
apparently [7] 45:12; 68:22; 151:23; 171:9,  
18; 172:9, 20  
appearing [1] 185:8  
applicable [4] 85:6; 108:14; 161:18, 20  
applied [1] 133:25  
applies [2] 62:21; 118:16  
apply [4] 108:1; 109:2; 118:17; 163:22  
apportion [1] 174:23  
apportionment [1] 175:2  
appreciate [1] 140:3  
approach [1] 91:21  
appropriate [1] 58:20  
approximately [3] 14:13; 97:1; 149:11  
April [2] 182:16; 183:13  
Arbor [1] 35:4  
area [4] 12:20; 16:16; 19:21; 69:22  
aren't [1] 151:13  
argued [1] 138:12  
argues [1] 137:19  
arguing [1] 173:11  
argument [1] 124:13

arguments [1] 143:13  
 articles [10] 36:6, 14, 17; 139:16, 24, 25;  
 150:16; 154:20; 155:4, 5  
 Asbestos [1] 66:6  
 asbestos [5] 66:6, 12, 14; 174:16, 17  
 aside [2] 18:4; 39:7  
 asking [18] 21:10, 12, 19; 26:12; 47:14; 61:22;  
 71:23; 85:14; 89:12, 13; 94:23; 95:5; 101:1;  
 127:12; 145:4; 148:2; 175:13  
 aspects [1] 21:23  
 assistant [1] 11:3  
 associated [6] 58:3, 5; 88:10; 89:16; 147:11;  
 172:21  
 Associates [3] 182:21; 183:22; 186:6  
 assume [7] 3:19; 6:24; 25:19; 102:22; 109:18;  
 113:5; 125:25  
 Assuming [1] 168:9  
 assuming [4] 26:3; 77:5; 120:4; 132:21  
 assumption [4] 54:21, 23; 120:1; 174:20  
 assumptions [3] 8:23; 122:16; 175:4  
 atmosphere [1] 178:18  
 ATSDR [4] 83:15, 21; 84:4, 8  
 attach [3] 3:10; 27:9; 74:7  
 attached [3] 179:20; 181:8; 184:20  
 attaching [4] 3:14; 156:12; 179:9; 180:5  
 attempt [1] 139:18  
 attempting [1] 138:19  
 Attorney [3] 183:19; 185:11, 21  
 attorney [11] 6:1; 25:19; 51:16; 82:2; 176:5;  
 10; 182:13, 14; 184:2, 15; 185:7  
 attorneys [4] 27:11; 176:16; 177:10; 184:3  
 attribute [1] 113:25  
 attributed [2] 16:3; 23:10  
 Augmentin [3] 129:15; 172:5, 18  
 August [2] 121:7  
 Author [1] 116:23  
 author [1] 84:24  
 authority [1] 181:19  
 available [8] 57:8; 58:9, 22; 59:1; 62:13, 20;  
 142:14; 147:2  
 average [8] 105:3, 5, 6, 9, 12, 16; 136:23;  
 138:18  
 avoid [1] 156:4  
 aware [31] 69:3; 74:12; 89:16; 98:22; 99:1, 4;  
 12, 22; 100:11, 22; 101:2, 4, 5, 8, 10, 14, 18;  
 102:10, 18; 128:21; 129:5, 8, 11, 14, 21;  
 130:9; 152:6; 153:11; 173:20; 178:16

## - B -

background [3] 12:24; 52:16; 166:6  
 backs [1] 150:15  
 balance [1] 125:17  
 Bar [1] 183:18  
 Barges [3] 31:8; 34:4; 187:12  
 barges [9] 6:21; 15:3; 17:11; 18:10; 27:12;  
 28:19; 31:14; 36:21; 118:5  
 base [1] 123:5  
 Based [3] 77:13, 14; 119:11  
 based [23] 7:16; 21:1, 20, 21; 27:4, 12, 17;  
 76:9; 77:4, 11, 19; 81:1; 104:17; 105:6; 113:6;  
 116:19; 118:8; 119:13; 122:16; 139:12, 13;  
 147:1; 153:16  
 basic [3] 14:16; 68:10; 143:24  
 basically [8] 21:8; 37:17; 68:18; 98:7; 107:1;  
 124:13; 153:13; 160:15  
 basing [6] 20:21; 22:9, 12; 80:23; 81:14;  
 93:21  
 basis [5] 56:3; 69:24; 77:9; 98:11; 143:19  
 bat [1] 149:25  
 battery [8] 159:19, 20; 160:1, 13, 15; 161:17,

21; 162:5  
 Bear [2] 5:19; 156:20  
 begun [1] 16:1  
 behavioral [1] 155:13  
 Beirne [1] 185:12  
 believe [28] 5:23; 7:8; 10:3; 15:22; 16:16;  
 17:18; 20:13; 30:24; 34:1; 35:8; 50:5; 76:4, 11;  
 83:3; 84:25; 117:24; 118:12; 126:11; 127:17;  
 131:11; 140:12; 141:20; 149:7; 150:25; 152:5;  
 153:8; 156:12; 169:24  
 beneficial [1] 108:24  
 benign [1] 112:18  
 Benzene [3] 75:11; 152:8; 158:13  
 benzene [19] 37:21; 75:5; 134:20; 140:14, 17,  
 24, 25; 141:4, 6, 8; 151:24; 152:6; 158:16, 17;  
 159:6; 164:15; 165:2, 8  
 bibliography [1] 35:19  
 billion [3] 79:15; 89:5; 131:18  
 binder [1] 5:2  
 biochemistry [2] 12:5, 10  
 Biological [2] 108:11; 110:11  
 biological [18] 38:18; 39:1, 10, 11, 21; 40:11;  
 108:9, 18, 22; 109:4; 110:15; 127:2, 21;  
 134:15, 16; 135:2, 7, 18  
 biologically [4] 38:12, 16; 40:6; 65:17  
 biomarker [2] 158:23; 160:11  
 Biomarkers [1] 162:4  
 biomarkers [28] 105:19, 23, 24; 106:8;  
 156:23; 157:3, 11, 12, 23; 158:2, 9, 12; 159:5,  
 16, 17; 160:18, 19; 162:1, 7, 10, 11; 163:5, 11,  
 19  
 biopsy [1] 109:16  
 bit [8] 4:10; 29:22; 31:18; 61:18; 69:15;  
 169:11; 171:7, 9  
 blasted [1] 112:21  
 blaster [1] 78:16  
 blasting [1] 70:21  
 blood [3] 42:17; 158:25; 162:19  
 BOB [1] 183:6  
 body [5] 107:8; 108:12, 17, 24; 134:21  
 book [28] 34:17, 19, 20, 22; 35:1; 80:5; 84:23;  
 90:1, 2, 4; 91:10, 11; 94:9, 19; 95:14; 116:21,  
 22; 117:4, 11; 150:24; 151:4, 7; 155:9; 156:9,  
 13; 187:18  
 books [24] 4:21; 5:1, 14; 32:20, 23; 33:1, 3,  
 14; 35:6, 13; 36:4, 15, 19; 82:5; 84:18, 20;  
 85:16; 155:16, 21, 24; 167:19; 179:7, 11;  
 187:22  
 Boulevard [1] 185:13  
 box [1] 19:3  
 boxes [1] 18:20  
 Branch [1] 12:16  
 BRAZORIA [1] 183:5  
 break [11] 5:8, 11; 20:19; 33:11; 39:2; 61:3, 8;  
 76:16; 80:22; 159:2; 171:3  
 breaking [2] 69:17; 81:9  
 breath [3] 99:5; 101:19; 102:11  
 breathe [1] 111:12  
 breathing [5] 78:13; 89:19; 96:6; 100:6, 8  
 brief [1] 32:10  
 briefly [3] 13:23; 31:11; 81:20  
 broad [2] 48:11; 143:15  
 broke [1] 23:1  
 bronchial [1] 102:1  
 bronchitis [3] 41:14, 17; 125:21  
 bunch [3] 33:14; 155:7; 164:22  
 butanol [1] 173:10  
 by-the-hour [1] 6:25

## - C -

cadmium [2] 112:11, 19  
 calculating [1] 8:12  
 call [1] 5:23  
 canal [1] 114:24  
 cancel [2] 151:20, 22  
 cancer [10] 38:20, 21, 24; 57:11; 66:7, 8, 9,  
 13; 109:24; 174:17  
 capable [3] 53:7; 54:11; 62:7  
 Carbon [3] 150:23; 164:13, 25  
 carbon [8] 150:10, 22; 151:1; 154:12; 164:23;  
 173:9, 16  
 carbon-based [1] 70:24  
 carcinogen [2] 75:11, 14  
 carcinogens [4] 37:21; 75:5, 9, 20  
 CASALE [1] 183:6  
 Casale [33] 14:2; 17:18, 20, 22; 18:12; 20:14;  
 27:11; 31:4; 34:5, 7, 12; 43:25; 44:16; 45:8,  
 13; 46:5; 49:6; 70:1; 76:1, 12; 87:5, 8; 93:17;  
 98:22; 99:12; 100:11; 102:23; 128:21; 168:24;  
 170:12; 171:8; 172:23  
 Casales [36] 6:2, 11; 16:14; 17:1; 30:21;  
 43:16; 77:19; 78:14; 81:23; 86:6; 92:18; 96:6,  
 13; 97:19; 109:18; 110:6; 111:5; 113:3; 114:5,  
 10; 115:4; 122:17; 123:6; 124:6; 132:10;  
 135:9; 149:6; 152:4, 24; 153:17; 154:4, 21;  
 156:17; 166:14; 168:22;  
 178:5  
 case [33] 3:24; 5:21, 22; 8:5, 16, 23; 13:24;  
 14:1; 18:9, 15; 32:12; 35:21; 38:24; 54:18;  
 62:21; 63:20; 66:6; 80:24; 81:10; 82:4; 93:17;  
 106:21; 111:2; 149:8; 150:24; 163:10; 174:6,  
 15, 21; 176:4, 13; 177:19; 179:17  
 case-specific [1] 39:22  
 cases [19] 28:9; 41:15; 55:9; 58:25; 106:20;  
 114:2; 120:14; 127:1, 2, 21; 132:23; 137:14;  
 157:16; 158:14; 163:18; 168:16; 176:12;  
 177:12, 24  
 categories [2] 63:24; 124:10  
 causal [1] 66:2  
 causation [8] 26:2, 10; 27:23; 38:4; 40:18;  
 57:7; 92:16; 174:9  
 causation-of-har-problems [1] 173:25  
 causative [3] 58:19; 94:3; 171:1  
 caused [44] 21:23; 23:8; 37:20, 22; 39:14, 15;  
 41:10; 42:5, 6, 16; 45:5, 16, 18; 46:14, 16, 17;  
 49:9, 15; 60:5; 68:1, 10; 69:25; 75:4; 76:4, 11;  
 82:7; 95:3; 112:6; 126:19; 127:1, 6; 128:12;  
 131:12, 14; 153:8; 169:9; 170:13, 23; 171:14,  
 20;  
 174:16, 18; 178:5  
 caustic [2] 75:6; 152:15  
 CC14 [1] 164:25  
 Cefin [2] 172:5, 18  
 Cefzil [2] 172:5, 18  
 central [6] 37:5; 100:2, 3; 118:18; 154:13, 23  
 certainty [4] 64:17; 96:13; 115:3; 119:5  
 CERTIFICATE [2] 182:3; 183:1  
 Certificate [2] 182:25; 186:11  
 certificate [1] 185:17  
 Certified [2] 182:5; 184:1  
 certified [1] 185:5  
 certify [4] 182:7, 9, 12; 184:5  
 cetera [10] 15:19; 37:20, 21, 22; 52:9; 91:1;  
 155:3; 179:10  
 chance [5] 4:4; 10:9; 51:3, 4; 82:25  
 change [2] 60:24; 110:16  
 changes [7] 10:15; 11:1; 51:19; 155:1; 180:6;  
 181:7; 184:19  
 characteristics [2] 30:17; 90:21  
 characterize [1] 97:6  
 charge [1] 8:7

Charged [1] 183:18  
 charges [1] 184:11  
 charging [2] 6:24; 7:2  
 checked [1] 33:3  
 Chemical [2] 32:9; 33:10  
 chemical [56] 26:2, 11; 27:24; 28:7, 22; 29:2, 8, 9; 30:5, 6, 11; 31:13; 38:4; 39:14; 40:18, 19; 41:23; 52:4, 18, 23, 25; 53:4; 54:8, 20, 22, 23; 55:25; 56:11; 62:5, 7; 63:2; 65:15, 17, 23; 67:16, 21; 75:6, 24; 76:11; 98:1; 107:7; 108:3; 118:6;  
 120:2, 8, 18; 121:12; 127:21; 133:16; 143:2; 147:7; 148:3; 157:1; 160:21, 22; 178:3  
 Chemicals [2] 116:23; 117:13  
 chemicals [94] 6:17; 25:15, 24; 26:8; 27:13; 28:4, 5, 15; 29:7; 30:13; 31:12, 13, 22; 32:18; 39:15; 42:21; 58:2; 70:3; 76:20; 86:20; 98:5, 9; 103:3, 21; 108:2; 117:11, 16; 119:21; 120:10; 122:23; 126:11, 18; 127:6, 9, 16, 18; 128:8, 14; 131:2;  
 132:18, 20; 133:8, 11, 25; 134:10, 16; 135:17; 136:10, 16; 140:6, 11; 141:24; 146:3, 9, 18; 147:10, 22; 148:14, 19, 20; 149:5, 24; 151:14; 152:3, 23; 154:11; 156:18, 24; 157:23; 158:20; 159:4, 25; 160:10; 162:5, 12; 163:4, 10, 12, 23; 164:20; 165:16, 21; 170:24;  
 171:22; 172:14; 173:8, 13, 23; 174:2, 14, 24; 178:7; 187:16  
 chemistry [2] 12:5, 10  
 chest [1] 102:1  
 Chloroform [1] 164:11  
 chloroform [3] 75:14; 164:10; 173:9  
 cholesterol [12] 43:25; 44:4, 8, 11, 17, 21; 45:4, 21; 46:5; 49:11, 12; 126:7  
 Chronic [2] 97:8, 11  
 chronic [9] 90:17, 22; 97:7, 9, 13, 20; 115:7; 118:16; 155:10  
 Chronology [3] 31:7; 34:4; 187:12  
 chronology [2] 17:10; 18:10  
 circle [1] 33:7  
 circumstances [1] 46:15  
 citation [1] 150:18  
 cite [5] 74:25; 82:6; 93:23, 25; 155:8  
 cited [3] 150:24; 155:17; 156:19  
 Civil [2] 184:6; 185:17  
 claim [3] 23:6; 38:24; 132:2  
 claimed [1] 137:7  
 class [2] 55:13; 177:23  
 classic [2] 150:23; 158:13  
 classical [1] 85:4  
 Claudio [1] 17:15  
 clay [1] 90:20  
 cleaned [2] 118:5; 119:22  
 cleaning [3] 6:21; 15:2; 28:19  
 clear [1] 26:18  
 clear-cut [1] 174:9  
 cleared [1] 108:23  
 client [1] 71:12  
 closest [3] 63:25; 64:7, 8  
 cluster [2] 62:15; 128:16  
 codified [1] 143:20  
 coefficient [5] 107:3, 4, 6, 12, 14  
 Collmer [1] 185:22  
 column [1] 28:11  
 combination [2] 40:7; 130:23  
 combine [1] 92:11  
 combined [2] 66:15; 151:18  
 coming [4] 54:22; 116:16; 156:16; 169:12  
 comment [1] 53:9  
 comments [2] 7:16; 138:11  
 Commercial [2] 116:23; 117:12

common [2] 107:23; 137:2  
 commonly [1] 119:2  
 community [9] 81:5; 142:7, 8, 16; 143:12, 16, 25; 144:4  
 companies [1] 64:12  
 company [1] 147:6  
 compare [1] 10:22  
 comparing [1] 162:16  
 compilation [2] 27:11; 154:11  
 complain [1] 99:8  
 complained [4] 45:9; 50:8; 124:7; 153:14  
 complaining [3] 42:14; 59:22; 128:11  
 complaints [2] 120:25; 124:9  
 complete [4] 76:7; 139:1, 20  
 completed [1] 184:12  
 completely [2] 63:24; 108:23  
 complicated [2] 89:13; 174:11  
 composed [12] 37:19; 70:7; 71:22; 72:5; 76:23; 78:10; 79:23; 81:12; 86:5, 24; 96:14; 111:17  
 composite [2] 98:7; 103:24  
 composition [4] 30:6, 12; 112:21, 22  
 compound [13] 55:7; 56:18, 22; 57:3, 5; 59:2; 63:10; 65:9; 75:24; 82:24; 108:23; 158:24; 162:17  
 compounds [39] 32:11; 36:20; 58:7, 8; 70:12, 13, 17, 24; 71:5, 12, 13; 72:3, 15, 19, 22; 74:9, 18; 75:6; 76:20; 82:17, 18; 83:17; 106:19; 111:18, 19; 116:8; 124:14; 132:6; 134:17; 135:5, 17, 20; 140:6, 11; 149:10, 12; 160:16; 178:17; 187:16  
 concentration [22] 29:11; 54:24; 55:1; 57:13; 67:1; 68:3; 79:3, 7; 87:21; 88:2, 7; 91:3, 7; 93:2; 108:7, 8; 123:23; 132:9; 134:11; 136:23; 148:10; 155:1  
 concentrations [11] 67:5, 8, 24; 68:4, 7; 87:21; 113:1; 123:19; 166:4, 5, 6  
 concern [1] 32:12  
 concerning [5] 30:6, 17; 81:11; 110:5; 131:6  
 concert [1] 127:19  
 conclude [1] 59:12  
 conclusion [8] 20:24; 21:19; 22:9, 13, 20, 24; 81:3; 82:7  
 conclusions [2] 20:21; 21:9  
 condensate [1] 111:11  
 condition [5] 41:19; 43:2; 102:3; 114:3; 169:6  
 conditions [4] 42:14; 48:15; 49:4; 92:8  
 conduct [1] 31:19  
 conducted [2] 33:8, 19  
 Conference [1] 136:1  
 confounders [1] 166:16  
 confounding [2] 65:25; 66:18  
 confusion [2] 154:14, 15  
 connection [2] 38:8; 40:8  
 consider [3] 110:4; 135:17; 169:19  
 considerations [1] 147:5  
 considered [4] 68:14; 97:13; 108:23; 160:17  
 consist [1] 154:25  
 consistent [1] 154:5  
 consisting [1] 144:5  
 constant [2] 20:15; 21:14  
 constantly [2] 120:5; 137:12  
 constituency [1] 112:12  
 consultant [3] 176:12, 17, 18  
 consultation [1] 7:4  
 consulted [1] 95:18  
 consulting [3] 176:20; 177:1, 12  
 contacted [1] 177:11  
 contained [1] 75:21  
 containing [1] 106:19  
 contains [2] 76:10; 181:5

contaminants [1] 165:22  
 content [1] 14:16  
 continued [1] 122:4  
 continuous [2] 122:5, 6  
 continuously [4] 87:12; 120:24; 173:4; 175:20  
 contribute [4] 99:10; 101:13; 103:2; 173:12  
 contributed [3] 23:4; 43:6; 45:8  
 contributing [6] 50:24; 66:3, 20; 131:1, 3; 170:25  
 controls [1] 160:1  
 conversation [1] 14:16  
 conversations [3] 11:6; 46:23; 122:17  
 copied [4] 5:7, 10; 155:24; 156:15  
 copies [10] 4:24; 33:14; 35:24; 36:8; 82:25; 179:6, 10; 184:12; 185:3; 187:21  
 copy [20] 3:11, 15; 5:6; 9:25; 10:8; 16:8; 29:21; 32:15; 33:10, 11; 37:9; 51:17; 73:9, 15; 76:16; 94:16, 17; 182:10; 185:1, 17  
 copyrighted [1] 139:5  
 CORPORATION [1] 183:4  
 corrections [1] 184:23  
 correlate [2] 68:7; 69:7  
 correlation [1] 64:5  
 cortisone [3] 49:23; 50:15, 18  
 Cost [1] 183:17  
 costs [1] 7:20  
 Cough [1] 126:5  
 cough [1] 171:14  
 coughing [3] 171:19, 20; 172:1  
 counsel [1] 5:15  
 counting [1] 8:13  
 COUNTY [1] 183:5  
 couple [4] 10:14; 98:21; 142:22; 157:18  
 course [17] 29:23; 50:18; 51:21; 59:5; 64:6; 89:25; 105:21; 122:18; 126:19; 128:15; 145:20; 165:12; 168:8; 170:5, 19; 173:7; 174:11  
 courses [6] 12:20, 22; 13:1, 2, 8  
 COURT [3] 182:3; 183:1, 3  
 cover [10] 36:16; 51:17; 74:17; 155:24; 156:1; 179:6; 180:3, 13; 187:21, 25  
 covered [2] 33:22; 129:20  
 covers [3] 75:23; 85:25; 86:2  
 CRC [2] 116:25; 117:3  
 create [3] 4:15; 5:15  
 created [2] 4:14; 26:18  
 criteria [4] 82:12, 22; 83:25  
 crystalline [1] 90:14  
 CSR [3] 182:20; 183:21; 186:5  
 cubic [2] 89:4, 19  
 cumene [1] 165:9  
 curiosity [1] 63:22  
 curious [1] 10:10  
 currently [1] 11:22  
 curriculum [3] 3:11; 29:17; 187:6  
 curve [2] 67:4, 9  
 curves [1] 67:19  
 customarily [4] 25:5, 25; 26:9; 27:20  
 cutting [1] 90:19  
 Cyclohexane [1] 141:15  
 cyclohexane [27] 30:10, 12; 116:9, 11, 18; 117:9, 23; 118:6, 23; 119:5; 120:4, 14, 23; 121:4, 22; 122:13; 123:4, 19, 23; 124:2, 19, 23; 131:19; 134:19; 141:13; 148:2; 157:10

- D -

D-o-n-o-g-h-u-e [1] 116:24  
 damage [5] 110:9, 20; 144:12, 14; 151:2  
 dangerous [1] 145:18  
 Darvocet [1] 172:18

data [13] 29:24; 30:1, 5, 11, 16; 63:13, 14, 23; 116:14; 119:7, 14; 142:13  
 date [1] 76:10  
 dated [2] 31:7; 187:12  
 day [6] 60:8; 132:24; 136:25; 137:1; 138:19; 181:20  
 days [8] 8:7, 8, 17, 19; 53:21; 132:24; 184:18, 24  
 DC [2] 171:17; 172:8  
 dead [1] 64:16  
 deal [2] 59:2; 139:16  
 dealing [2] 63:23; 80:24  
 deals [1] 85:1  
 December [2] 182:25; 186:11  
 defendant [1] 177:2  
 defense [2] 177:5, 10  
 defined [2] 72:11; 146:8  
 definite [1] 56:21  
 definitely [1] 177:9  
 definition [12] 24:9, 10; 136:22; 137:3, 21, 23; 138:3, 8, 15; 139:11, 17; 153:16  
 degree [15] 11:25; 12:4, 7; 38:13; 59:21; 65:3; 96:12; 104:6; 115:3; 119:4; 135:23; 151:21; 160:7; 165:23  
 degrees [2] 12:5; 113:21  
 delivered [1] 185:3  
 Department [1] 136:11  
 department [1] 13:3  
 depend [3] 46:15; 59:21; 113:14  
 dependant [1] 179:1  
 depending [5] 63:19; 112:7, 20; 113:21; 142:13  
 depends [3] 92:4; 137:24; 168:8  
 Depo-Medrol [1] 172:19  
 depose [1] 51:19  
 DEPOSITION [1] 183:9  
 Deposition [2] 7:4; 22:21  
 deposition [26] 4:1; 7:21, 23, 24; 8:5, 14; 17:15, 18; 18:11; 22:14, 23; 29:18; 31:4; 34:5, 6, 8; 35:15; 36:19; 37:7; 156:15; 179:22; 184:14, 25; 187:8  
 Depositions [1] 7:3  
 depositions [1] 3:19  
 Depression [1] 167:13  
 depression [13] 99:23, 25; 100:4, 23; 101:3; 102:20; 154:13, 14; 155:11; 167:16, 17, 20  
 dermal [2] 64:10; 134:2  
 described [3] 14:20, 21; 25:24  
 determination [2] 118:22; 119:8  
 determine [21] 41:22; 42:21; 52:3; 67:20; 77:1; 78:9; 80:15; 88:7; 97:23; 104:11, 21; 105:13; 109:12, 14; 111:21; 118:3; 119:1; 123:5; 136:15; 146:2; 148:8  
 determined [1] 115:15  
 determines [1] 136:9  
 determining [5] 48:12; 77:10; 145:15, 17; 161:1  
 develop [1] 93:7  
 developed [2] 48:17; 142:11  
 developing [2] 90:15, 21  
 development [4] 38:11, 23; 39:8; 91:5  
 dexterity [2] 161:4, 11  
 Diabetes [1] 168:14  
 die [1] 79:13  
 Diesel [1] 164:18  
 diet [1] 47:8  
 dietary [2] 44:23; 168:16  
 differ [1] 104:15  
 difference [2] 133:19, 20  
 differentiate [1] 7:20  
 differs [1] 53:13

difficult [5] 57:21; 59:5; 67:23; 69:8; 96:20  
 difficulty [3] 100:5, 8; 126:23  
 diluted [1] 79:3  
 dioxide [2] 106:17, 23  
 direct [1] 167:18  
 disabled [1] 144:6  
 discomfort [1] 126:20  
 discrete [1] 119:1  
 discuss [1] 73:25  
 discussed [11] 10:24; 14:17; 15:12, 13; 32:22; 33:8; 35:9; 145:10; 169:17; 179:15, 21  
 discusses [1] 90:11  
 Discussion [4] 29:16; 76:18; 179:5; 180:9  
 discussion [2] 32:10; 143:22  
 Disease [1] 83:16  
 disease [20] 38:9, 23; 40:4; 41:3, 5, 6, 7; 42:4; 56:23, 25; 59:13; 62:15, 18; 90:11, 12; 91:6, 7; 93:1, 4; 94:8  
 diseases [3] 38:19; 66:1; 72:23  
 disorder [2] 88:19; 167:20  
 displayed [1] 117:17  
 dispose [1] 29:5  
 disposed [2] 28:12, 21  
 dissociate [1] 126:21  
 dissolved [2] 28:24, 25  
 distance [1] 78:21  
 distances [1] 82:10  
 distinction [1] 145:9  
 distress [3] 100:9; 101:12; 125:9  
 distributed [1] 122:7  
 DISTRICT [2] 183:3, 6  
 disturbances [4] 23:24; 154:25; 155:2  
 disturbed [1] 24:14  
 divide [2] 142:12; 143:14  
 divided [1] 90:13  
 dizziness [3] 125:17; 155:2, 12  
 DM [2] 172:7, 9  
 Doctor [38] 3:7, 10, 18; 5:19, 20; 7:11; 9:3; 11:22; 21:25; 25:22; 27:8; 29:21; 31:10; 45:10; 49:5; 51:11; 52:21; 57:1; 61:2, 22; 69:20; 71:11; 74:15; 76:22; 102:22; 108:4; 121:15; 123:3; 135:25; 151:10, 13; 155:15; 171:6; 175:23; 179:9; 180:4, 11  
 doctor [1] 176:7  
 document [22] 4:4, 5, 8; 5:17; 26:15, 21; 27:14, 15, 18; 28:3; 31:18; 80:9; 82:11, 12, 14, 20; 83:21, 23; 139:12; 143:18; 150:14  
 documentation [5] 54:17; 55:19; 95:15, 17; 144:25  
 documented [5] 52:25; 53:6; 54:10; 58:20; 124:14  
 documents [45] 4:7, 13, 16, 22; 17:6, 8, 9; 18:4, 9, 14; 25:4, 17; 26:6, 19, 20; 27:5; 30:15; 32:20; 33:23; 35:18; 36:2, 11; 77:12, 17; 80:15, 17; 81:1, 4, 11; 82:3, 4, 5, 15, 16, 17; 83:1, 13, 16; 84:18; 95:13; 151:8; 179:20  
 doesn't [7] 28:7; 43:7; 69:7; 93:4; 128:13; 138:21; 170:20  
 dosage [1] 131:17  
 Dose [1] 66:25  
 dose [22] 53:6; 54:10; 56:7; 57:5; 58:3, 4, 21; 66:24; 67:1, 9, 12, 15, 20; 68:15, 21; 104:11, 17, 21; 105:14; 107:25; 108:4  
 dose-response [7] 67:8, 19; 68:11; 94:24; 104:9, 20; 105:13  
 doses [6] 52:8; 68:7, 19, 25; 69:4; 108:7  
 doubt [2] 64:20; 163:13  
 downwards [1] 137:13  
 Dr [8] 26:20; 76:19; 77:22; 94:19; 156:13; 172:22, 23; 187:15

draft [8] 9:17, 19; 10:7, 11, 13; 180:2, 5; 187:24  
 drafts [2] 9:16; 10:11  
 drawing [1] 164:19  
 Drexel [1] 12:15  
 drillers [1] 90:17  
 drinking [4] 43:13; 48:4; 96:8; 114:23  
 driven [3] 16:23; 19:13, 21  
 driving [3] 16:16; 19:7, 18  
 drove [1] 16:16  
 drug [17] 64:12; 67:20; 99:5, 23; 100:22; 101:5, 14, 21; 129:9, 12, 14, 18, 21; 130:14, 15, 18; 166:22  
 drugs [32] 50:1, 6, 17; 51:7; 102:24; 103:9, 13, 16, 23; 130:4, 12, 20, 23; 131:5, 14; 159:25; 161:18; 170:13, 21; 171:16, 21, 25; 172:11, 24; 173:1, 4, 6, 12, 21; 174:7, 25; 175:18  
 dryness [1] 101:25  
 Duarte [8] 17:15; 18:11; 22:14, 18; 34:5, 6, 8; 35:14  
 duces [3] 4:1; 29:19; 187:9  
 due [10] 37:19; 43:9; 44:25; 48:21; 98:3, 4, 8; 111:7; 126:18; 153:19  
 duly [2] 3:2; 184:7  
 duration [1] 91:3  
 dust [11] 37:19; 70:7; 76:23; 78:9; 79:23; 81:12; 86:5, 24; 96:14; 111:17; 133:17  
 dysfunction [1] 155:12

## - E -

early [1] 48:20  
 easier [5] 76:15; 127:24; 155:14, 25; 165:12  
 easily [1] 134:24  
 easy [1] 93:11  
 educate [1] 28:15  
 education [1] 12:12  
 educational [1] 12:24  
 effect [73] 43:7; 48:20; 49:7; 57:13, 14; 64:14; 66:15, 16; 67:2, 5, 21, 24; 68:8; 69:7; 78:19; 93:19; 94:3; 95:3; 96:1; 99:22; 100:3, 22; 101:3, 8; 102:19; 104:12, 14, 16, 22; 105:15; 108:25; 110:22; 118:13, 16; 129:12, 17; 130:9, 11, 17; 131:20; 137:1; 147:18, 24; 148:4, 8, 21; 149:1, 2; 151:17; 154:11; 155:13; 157:2, 6, 12; 159:16, 17, 22, 24; 160:4, 7, 8, 11, 21, 22, 24; 162:1, 4; 167:18; 172:12; 175:16  
 effects [55] 23:25; 32:19; 44:4; 50:6, 12, 17; 19; 51:6; 59:10; 64:10; 66:1; 68:14; 88:9; 89:2, 17, 23; 91:14; 92:20; 93:6; 98:8; 99:5; 101:24; 102:25; 103:23; 112:5; 116:15; 117:10, 18, 25; 118:17; 124:1; 127:18, 21; 129:6; 133:21; 147:12; 15; 148:12, 22; 153:17; 154:21, 23; 155:1, 10; 159:18; 162:14; 166:22; 170:13; 171:18, 21; 172:10; 174:8; 175:15  
 Eggleston [3] 27:3; 31:6; 187:11  
 eggs [2] 54:19; 60:7  
 eight [9] 86:15; 90:22; 114:16; 118:24; 120:5; 144:1, 14; 179:7; 187:22  
 eight-hour [3] 8:8; 136:24; 144:24  
 eight-year [2] 20:14; 21:13  
 elderly [1] 144:6  
 element [4] 38:25; 39:17; 40:17; 106:20  
 elements [1] 38:3  
 Elevated [1] 126:7  
 elevated [1] 49:12  
 eliminated [2] 66:2; 108:13  
 emission [2] 29:24; 119:9

emitted [25] 30:7, 18; 76:4; 86:5; 87:4, 22;  
112:24; 113:5; 118:3, 23; 119:2, 6, 15; 120:4,  
9, 12, 24; 121:5; 122:14; 123:6, 11, 19;  
132:20, 22, 23  
employed [2] 182:13; 184:3  
encephalopathy [2] 154:24; 155:13  
enclosed [2] 31:7; 187:12  
encounter [1] 165:25  
Encyclopedia [3] 32:9; 33:9; 35:13  
end [1] 37:7  
endocrine [2] 168:12, 13  
enjoying [1] 24:20  
ensure [3] 50:23; 91:20; 168:24  
Environment [10] 34:20; 35:2; 90:2, 3; 94:10,  
19; 151:4, 6; 156:10; 187:19  
environment [7] 145:13; 163:25; 164:3;  
165:4, 7, 17, 18  
environmental [8] 11:23; 25:6, 7, 25; 26:9,  
14; 27:20; 94:8  
enzyme [2] 162:19, 25  
EPA [9] 12:18; 81:4; 82:12, 14; 83:10, 15;  
143:18; 145:2, 10  
equal [1] 40:11  
equipment [1] 78:13  
erythromycin [1] 172:19  
essentially [8] 54:12; 58:15; 67:3, 8; 105:23;  
106:17; 110:19; 111:9  
establish [9] 38:3; 40:18; 56:9; 57:4; 79:17,  
20; 105:4, 5; 174:21  
established [7] 38:8; 58:2; 98:13; 127:8;  
146:19, 23; 148:6  
establishing [3] 55:21; 144:22; 145:11  
estimate [6] 8:7, 15; 19:9, 23; 20:3; 88:6  
et [11] 15:19; 37:20, 21, 22; 52:8; 91:1; 94:8;  
155:3; 179:10  
ethanol [3] 150:9, 23; 173:9  
ethyl [2] 165:2, 8  
evaluate [1] 47:6  
evenly [1] 122:6  
event [2] 68:16; 185:1  
evidence [8] 39:13; 40:2, 25; 44:6, 10; 59:8;  
62:7; 79:14  
exacerbated [7] 41:19; 44:2, 8; 45:16, 18;  
46:1; 169:7  
exacerbating [1] 170:25  
exacerbation [1] 41:2  
exact [4] 56:7; 82:20; 110:1  
Exactly [4] 58:10; 117:14; 155:19; 174:19  
exactly [27] 6:16; 20:25; 21:20; 22:5; 23:2;  
24:17; 26:12; 27:25; 29:9; 45:5; 60:24; 70:13;  
71:12; 84:6; 91:19; 92:7; 106:16; 109:7; 110:3;  
112:11, 22, 24; 118:14; 119:4; 122:4, 11;  
162:8  
EXAMINATION [2] 3:5; 187:3  
examination [1] 184:17  
examine [1] 174:6  
example [37] 38:20; 39:12, 25; 41:2, 13; 42:7;  
43:5, 13, 24; 45:12; 47:5; 48:17; 49:12; 53:20;  
54:16; 55:12; 59:7; 64:9; 66:6; 97:25; 112:18;  
121:4; 134:19; 150:4; 151:23; 154:12, 13;  
155:9; 159:23; 160:24; 162:15, 21; 164:5;  
168:23, 25; 170:18  
examples [3] 39:4; 43:12; 157:18  
excreted [2] 134:24; 158:15  
Excuse [1] 63:12  
exercise [4] 43:14; 44:23; 47:5; 167:1  
exert [1] 108:24  
exhausted [1] 178:17  
Exhibit [69] 3:10, 25; 27:9, 10, 14, 18; 28:11;  
29:8, 17, 18, 21; 31:6, 11; 71:2; 74:17; 75:21,  
23; 76:5, 10, 17, 19; 111:19; 116:8; 117:20;

118:10, 12, 25; 121:17; 123:12; 132:7; 133:11,  
25; 134:10, 17; 135:16; 140:12; 141:25; 146:9,  
19;  
147:11, 22; 148:2; 152:3; 156:9, 12, 22, 25;  
157:23; 158:8; 159:15; 161:19; 162:5, 12;  
163:23; 178:8, 9, 13; 179:6, 10, 20; 180:2, 5;  
187:6, 8, 11, 15, 18, 21, 24  
exhibit [5] 74:7; 76:15; 118:4, 10; 121:1  
exhibits [2] 184:13; 185:3  
exist [1] 83:23  
experience [7] 12:14; 80:23; 81:2, 14; 93:22;  
164:20; 179:25  
experienced [2] 56:8; 60:11  
expert [3] 7:17; 50:13; 176:20  
expertise [2] 18:6; 62:2  
Expires [2] 182:25; 186:11  
explain [1] 158:1  
explained [1] 111:6  
explanation [2] 101:11; 172:13  
exposed [39] 50:4; 53:21; 55:8; 57:2, 4; 59:8;  
66:12, 14; 67:2; 77:9, 11; 82:7; 92:12, 19;  
93:19; 95:22; 96:2, 13, 17, 22; 103:21; 108:16,  
19; 115:4; 116:2; 123:11; 126:12; 133:4;  
135:9; 136:25; 148:20; 149:6; 152:4; 154:22;  
160:2; 172:14;  
173:7, 16  
Exposure [1] 108:4  
exposure [154] 8:24; 26:2, 11; 38:4, 9, 22;  
39:7; 40:3, 9, 19; 41:5, 10, 16, 19; 42:6; 43:8;  
44:3; 45:25; 46:1, 6, 7, 13; 48:21; 49:15, 21;  
52:19, 23, 24; 53:4, 6, 12; 54:8, 10; 55:4, 7, 8,  
21, 23, 24; 56:1, 2, 7, 8, 11, 14, 16, 19, 20, 22,  
24; 57:10; 58:19, 21; 59:12, 14, 18; 60:3, 5;  
62:5, 17; 63:16; 65:15, 23; 74:19; 75:10, 21,  
25; 79:24; 81:12; 89:1; 91:4, 11; 92:1, 20;  
93:18; 94:1, 2; 95:3, 9, 24; 96:5, 23; 97:4, 7, 8,  
10, 11, 20, 25; 98:2, 4, 8; 105:20; 106:8;  
108:2, 4, 7; 110:6, 7; 113:12;  
114:2, 10, 14, 19; 115:6, 7; 123:15; 124:2;  
126:18; 127:9; 128:7, 13; 131:17, 19; 133:5, 7,  
11, 19; 134:11; 136:9, 16; 137:20; 141:25;  
143:2; 144:23; 145:17; 146:2, 5; 147:10;  
151:18; 152:13; 153:19; 154:6; 156:18, 25;  
157:2, 6, 11; 158:16, 17, 23; 159:5;  
160:21; 163:6; 168:10; 171:15, 21; 174:2  
exposures [27] 6:11, 16; 20:13; 21:10; 27:24;  
28:1; 37:18; 38:19; 42:7; 44:5, 9, 25; 45:16;  
48:24; 49:1; 55:20; 69:25; 106:2; 148:23;  
151:19; 153:8; 167:18; 169:6, 7, 8, 9; 174:22  
expound [1] 38:16  
expressed [6] 49:8; 52:23; 53:4; 62:4; 65:15,  
22  
extent [2] 66:18; 85:17  
extrapolate [2] 63:1; 68:4  
extrapolation [3] 63:17, 18; 65:4  
extrapolations [1] 67:19  
Extremely [1] 179:1  
extremely [4] 44:11; 53:18; 145:21; 150:22  
eyes [1] 125:7

## - F -

Flu-r-a-z-e-p-a-m [1] 98:24  
fabrics [1] 164:5  
facilities [3] 16:12, 14, 18  
facility [9] 16:21; 19:8, 14, 19, 21, 24; 20:7;  
77:3; 128:14  
fact [23] 44:7; 46:14; 47:16; 60:1; 63:7; 73:11;  
77:4; 78:25; 80:17; 83:20, 22; 84:5; 103:13,  
22; 113:6; 131:4; 133:23; 139:2, 21; 150:15,  
24; 171:13

factor [13] 24:6; 41:4, 8; 43:4; 59:3; 60:4, 11;  
120:7; 127:3; 142:13; 143:14; 170:25; 171:1  
factors [10] 42:5; 66:3; 91:5; 92:5; 126:22;  
127:3; 128:9; 131:1; 170:23, 24  
facts [3] 13:24; 14:1; 18:8  
faculty [1] 13:3  
fair [22] 29:6, 10; 31:15; 40:5; 46:18; 49:5;  
60:16; 67:13; 68:6, 24; 75:23; 92:25; 100:7;  
112:23; 114:9; 124:14, 20; 151:20; 155:15;  
157:21; 168:18; 170:9  
fairly [4] 111:2; 119:2; 137:5; 146:13  
fall [1] 124:10  
false [1] 60:22  
familial [4] 44:22; 49:4; 52:6, 16  
familiar [7] 12:18; 31:23; 38:3; 47:8; 50:19;  
135:25; 145:24  
family [2] 48:16; 170:5  
fashion [1] 176:3  
father [1] 48:19  
fax [4] 31:6; 180:3; 187:11, 25  
faxed [1] 10:14  
feel [6] 45:10; 63:16; 70:3, 8; 173:23; 180:13  
felt [1] 20:6  
females [1] 39:15  
fever [1] 114:3  
fibrogenic [1] 90:25  
field [2] 12:19; 18:5  
figure [2] 20:20; 177:6  
final [3] 9:19; 10:19, 25  
financial [2] 182:15; 184:4  
find [11] 70:13; 75:19; 80:5; 92:14; 143:9, 19;  
150:19; 155:22; 158:3; 163:17; 178:25  
Fine [3] 71:17; 73:17; 158:13  
fine [9] 3:18; 5:9; 20:2; 69:15; 73:17, 25; 87:4;  
163:16, 21  
finish [2] 171:3; 180:8  
finished [1] 118:20  
finishing [1] 90:19  
finite [1] 110:9  
firm [3] 10:14; 177:13, 17  
First [1] 118:2  
first [31] 3:2, 24; 5:20, 21; 20:23; 21:24; 22:5;  
23:5; 24:10; 25:12; 32:8; 38:1, 7; 40:2, 7;  
56:13; 63:12; 70:7; 72:20; 76:22; 77:2; 116:9,  
18; 117:23; 121:16; 126:17; 127:15; 143:24;  
150:13; 185:7  
fits [1] 168:10  
Fitzgerald [1] 94:8  
five [5] 5:24; 108:22; 130:20; 171:15; 177:4  
five-tenths [1] 90:24  
five-year [1] 122:14  
flagged [1] 33:4  
fleeting [1] 59:11  
Floor [1] 185:13  
flu-like [1] 114:3  
flurazepam [3] 98:23; 172:6, 19  
focus [2] 69:23; 120:18  
follow [1] 89:10  
following [1] 55:22  
follows [1] 3:3  
foregoing [3] 181:5; 182:7, 9  
forgive [2] 11:18; 140:18  
forgot [1] 73:18  
form [3] 28:1; 90:14; 111:10  
formed [2] 69:24; 70:19  
forming [3] 110:5; 119:19; 135:19  
formulated [2] 137:7; 142:10  
formulating [1] 138:5  
forward [1] 69:20  
found [5] 33:4; 116:13; 152:16; 163:24; 164:2  
foundries [1] 90:19

four [3] 5:24; 8:7, 8  
fraction [8] 107:7, 10, 19, 21, 24; 143:17  
free [1] 45:10  
frequency [6] 42:3, 19; 51:25; 52:17; 92:13; 119:9  
frequent [2] 41:18; 42:11  
frequently [1] 41:18  
front [10] 5:4, 5, 10, 14; 6:15; 9:12; 33:1; 73:14, 22; 179:10  
fuel [1] 164:18  
FUERST [33] 4:9, 12; 5:7; 17:13; 18:19; 21:4; 22:21; 26:17, 24; 27:2, 6; 29:14; 61:7, 11, 16, 20; 69:12, 16; 73:18, 24; 77:21; 80:12; 86:20; 100:16; 102:7; 122:24; 129:24; 155:23; 156:5; 172:22; 177:21; 179:1; 180:17  
Fuerst [10] 5:23; 6:1, 25; 7:10; 10:14, 24; 11:7, 8, 12; 185:20  
full [3] 3:7; 8:19; 164:23  
fume [2] 112:19; 114:3  
function [3] 105:23; 106:11; 155:12  
furnish [1] 145:6

## - G -

gained [2] 13:23, 25  
galvanized [1] 72:5  
gas [1] 140:21  
gasoline [1] 164:16  
gave [3] 103:9; 137:22; 139:18  
gear [1] 98:15  
generated [1] 18:14  
generating [1] 166:10  
genetic [4] 44:22, 25; 52:6, 16  
gets [1] 176:8  
Give [1] 98:19  
give [16] 14:15; 16:8; 19:9; 39:24; 43:11; 48:11; 72:21; 92:8; 94:4, 7; 131:21; 139:15; 140:1; 150:18; 157:17, 22  
given [10] 3:19; 53:15; 73:4; 104:9; 105:12; 128:16; 139:11; 151:19; 181:6; 184:10  
giving [5] 39:4; 43:11; 55:11; 60:14; 180:11  
glass [1] 90:20  
goes [2] 87:5; 110:19  
gotten [1] 169:23  
Governmental [1] 136:1  
graded [1] 160:7  
graduate [3] 12:4, 7; 13:4  
granted [1] 78:15  
Great [1] 61:21  
great [3] 83:8; 144:20; 156:3  
greater [3] 148:22; 165:23  
group [3] 53:20; 138:6; 162:14  
groups [4] 82:18; 136:13, 14; 138:10  
guess [33] 11:5; 21:12; 26:11; 29:6; 36:3; 38:12; 57:19; 71:4; 77:8; 86:14; 92:13; 100:6; 105:10; 112:13; 114:13; 119:3; 121:16; 122:3; 133:13; 136:5; 137:9; 140:15; 142:2; 152:14; 154:18; 159:9; 163:2; 165:25; 170:8; 172:10; 173:19; 175:7; 177:23  
guessed [1] 56:2  
guessing [2] 157:16, 24  
guideline [1] 55:4  
guys [3] 61:10; 69:14; 179:2

## - H -

H-y-d-r-o-c-e-t [1] 99:15  
hadn't [2] 48:7; 129:1  
Half [1] 19:9  
half [2] 14:14; 108:13  
half-life [17] 108:10, 11, 18; 109:4, 13; 110:1,

4, 9, 11, 15; 115:20; 134:22, 25; 135:2, 7, 10, 18  
half-lives [1] 115:12  
half-lives [5] 108:22; 116:1; 134:15, 16; 135:21  
Halopane [1] 172:20  
hand [5] 48:22; 59:15; 169:8; 182:16; 186:1  
handed [2] 74:3, 8  
hands [1] 125:19  
handwritten [3] 9:25; 76:19; 187:15  
happens [2] 7:17; 62:19  
happy [1] 84:15  
hard [6] 47:6; 53:15; 104:16; 126:21; 171:1; 175:4  
harm [6] 78:10, 12; 79:24; 80:8; 82:8, 9  
harmful [4] 68:19; 69:1; 108:24; 120:19  
hasn't [1] 63:3  
haven't [20] 7:13; 9:6, 8; 16:20; 34:15; 35:17; 44:13, 15; 47:2; 50:16; 52:3; 74:13; 76:8; 81:6; 107:18; 119:9; 122:15; 148:7; 169:23  
hazardous [1] 135:21  
head [2] 13:8; 161:12  
Headaches [1] 125:11  
headaches [6] 125:25; 126:1; 170:19, 20, 22  
heading [1] 31:13  
Health [13] 34:20; 35:2, 3; 84:3; 90:3; 94:10, 19; 136:13; 145:25; 151:5, 6; 156:10; 187:19  
health [22] 23:25; 24:21, 25; 48:16; 49:4; 78:19; 83:25; 88:9; 112:5; 113:19; 124:1; 126:16; 131:1; 137:8, 17, 20; 146:23; 147:12, 15; 153:17; 166:14  
healthy [1] 47:6  
heard [6] 12:25; 74:12; 107:11, 16, 18; 136:6  
hearing [2] 125:3; 174:1  
hearings [1] 185:6  
heart [3] 37:16; 48:17, 20  
help [4] 4:9; 26:17; 36:25; 55:10  
helpful [1] 170:3  
hepatic [1] 151:2  
hepatitis [1] 168:25  
hepatotoxic [3] 36:21, 22, 25  
HERCULES [1] 183:3  
Hercules [38] 6:18; 9:5; 14:19, 23; 15:17, 21; 16:1, 4, 13, 14; 17:6, 8, 11, 17; 18:10, 20; 19:7; 25:16, 17, 20, 23; 26:7, 13, 19, 25; 27:5, 12; 31:8; 34:4; 76:4; 77:2, 12; 104:2, 6; 117:16; 128:14; 169:3; 187:13  
hereby [2] 182:6; 184:5  
herein [1] 184:21  
hereto [2] 181:9; 184:20  
hexane [6] 134:20; 150:4, 6, 17; 164:16  
hey [1] 176:10  
high [21] 42:17; 43:25; 44:5, 8, 17; 45:4, 21; 46:4; 48:18, 19; 49:11; 68:15; 92:24; 114:8; 132:14; 139:2; 149:14; 153:18, 22; 154:1; 173:13  
high-pitched [1] 37:19  
high-powered [1] 90:17  
higher [7] 67:7, 12, 13; 68:4; 91:6; 105:8; 137:18  
highest [1] 173:14  
history [2] 43:1; 170:6  
hit [2] 81:20; 168:4  
Hold [2] 129:24; 172:22  
home [2] 86:6; 132:10  
hoping [2] 70:16; 164:8  
hormone [1] 162:25  
hour [4] 7:2, 4, 5; 8:1  
hours [6] 8:4; 14:11, 14; 143:25; 144:1, 14  
house [9] 14:5, 6; 16:7, 9; 19:11, 15, 20, 24; 134:12

Houston [6] 182:23; 183:15, 24; 185:14, 24; 186:8  
human [4] 63:13; 64:1; 135:11  
humans [22] 62:19; 63:3; 64:7, 15, 25; 65:7; 68:2; 88:10; 104:13, 25; 105:15; 109:5, 13; 110:1, 5; 118:17; 124:2; 131:20; 135:7, 18; 155:10; 159:20  
hundred [3] 137:15; 142:12; 166:9  
hundredfold [1] 137:15  
hundredth [1] 142:16  
hundredths [1] 142:15  
hurdle [1] 140:9  
hurt [1] 178:5  
Hydro [1] 99:14  
Hydrocet [3] 99:13, 15; 172:6  
hydrochloric [1] 152:15  
hydrogen [2] 54:22, 24  
Hygienists [1] 136:2  
Hypertension [1] 42:17  
hypertension [4] 42:8, 12; 99:16

## - I -

I'd [11] 45:22; 50:22; 70:1; 119:16; 134:18; 140:3; 141:20; 153:10; 157:14; 170:15; 176:10  
I've [20] 12:14; 13:2; 22:5; 32:20; 34:2; 36:7; 61:16; 73:7; 83:2; 86:18; 87:14; 107:18; 116:12, 14; 117:18; 150:16, 24; 177:11, 12  
idea [5] 14:16; 87:20; 88:1; 123:18, 22  
identify [1] 90:9  
idiopathic [1] 42:9  
ii [1] 184:9  
iii [1] 184:11  
iv [3] 59:9; 137:8, 20  
illness [22] 41:23, 24; 42:21; 52:4, 24; 53:5, 7; 54:9, 11; 56:11; 57:3, 7; 58:4, 5, 20; 59:22; 60:5; 62:5, 8; 65:16, 18, 23  
illnesses [6] 15:13, 19, 21, 25; 16:3; 76:12  
impact [6] 24:1; 51:9; 60:15, 17; 63:9; 131:6  
impacted [1] 23:23  
impacting [2] 20:16; 21:16  
impaired [1] 125:3  
impairment [1] 155:11  
important [4] 47:20; 71:11; 85:18; 94:25  
impossible [1] 69:6  
inadequacies [1] 168:16  
Inc [2] 117:3; 183:22  
incident [1] 120:13  
include [3] 23:16; 24:3; 179:19  
included [1] 15:3  
includes [2] 23:25; 167:20  
inclusive [2] 152:25; 153:6  
incoordination [1] 154:14  
incorporated [1] 184:21  
increase [6] 67:1, 3, 6, 9, 11  
INDEX [1] 187:1  
Indicate [1] 157:2  
indicate [12] 28:1, 7; 104:3, 5; 105:19; 116:13; 156:25; 159:21, 22; 160:20, 22; 173:5  
indicated [6] 15:23; 28:9; 37:23; 56:22; 116:14; 117:17  
indicates [10] 28:4; 43:8, 24; 56:1; 57:2; 90:12; 117:10; 123:14; 139:18  
indicating [2] 4:23; 79:23  
indication [5] 32:21; 99:18; 139:2, 20; 158:16  
indications [1] 32:21  
indirect [1] 44:3  
Indirectly [1] 135:20  
indirectly [1] 45:1  
individual [13] 41:13, 17; 53:14, 16; 55:2; 62:6; 66:8; 91:4; 104:21; 105:8; 148:20;

174:21  
 individuals [6] 53:13; 92:5, 25; 144:5; 162:16, 18  
 indoor [6] 163:24; 164:3; 165:4, 7, 17, 19  
 indoors [1] 165:23  
 inducing [2] 53:7; 54:11  
 industrial [3] 116:23; 117:12; 136:1  
 industrial [1] 166:11  
 industries [1] 90:18  
 industry [1] 137:25  
 infection [2] 101:9; 129:4  
 infections [1] 45:14  
 infectious [1] 66:1  
 information [30] 32:17; 47:12, 18; 48:15; 49:22; 53:11; 56:4; 58:9, 22; 59:1; 60:14; 62:13, 20; 63:8; 74:14; 76:10; 85:19; 86:18; 119:17; 122:18; 137:13; 138:25; 145:19; 147:2; 169:2, 20; 170:2; 175:6; 179:7; 187:22  
 infrequently [1] 120:15  
 ingest [1] 134:5  
 ingestion [4] 114:25; 133:14, 17, 24  
 inhalation [5] 114:22; 115:1; 133:9, 22; 134:9  
 inhaled [1] 115:12  
 initially [2] 137:6  
 initiation [1] 104:2  
 input [2] 11:6, 11  
 insomnia [1] 130:17  
 insomnia [6] 129:6, 11, 18; 130:9, 21, 22  
 instance [5] 30:10; 47:10; 60:1; 89:4; 138:2  
 institute [2] 84:2; 136:12  
 inland [1] 50:25  
 interact [1] 152:17  
 interacted [1] 128:9  
 interaction [4] 66:5, 11, 21; 130:23  
 interactions [2] 34:18, 25  
 interest [2] 182:15; 184:5  
 interested [1] 4:3  
 interfered [2] 24:15, 22  
 interference [1] 24:7  
 intermittent [7] 87:15, 16; 97:2; 114:16; 123:15; 133:5  
 intermittently [1] 132:22  
 interrupt [4] 13:6; 18:1; 21:25; 139:23  
 interviewing [1] 14:2  
 intracoastal [1] 114:24  
 invalid [1] 144:5  
 invasive [2] 109:21; 159:1  
 invention [1] 139:9  
 involved [10] 5:21, 22; 27:13; 52:2; 70:4; 74:18; 75:25; 106:5; 116:2; 175:24  
 IQ [3] 161:1, 9, 10  
 iron [1] 112:18  
 iron [1] 112:9  
 irritating [3] 41:16; 127:17; 154:7  
 imitation [9] 64:13; 88:21; 110:8; 126:3; 131:2; 168:20; 172:3, 10, 12  
 itchy [1] 125:7  
 item [1] 38:13  
 iv [1] 184:14

## - J -

John [3] 116:24; 177:18, 21  
 Johnson [1] 161:14  
 joint [2] 49:24; 124:12  
 JORDAN [45] 3:5; 4:11, 19; 5:9; 18:24; 21:5; 22:22; 26:23; 27:4, 7; 29:15, 20; 31:9; 61:2, 9, 13, 17, 21; 69:9, 13, 19; 73:20; 74:2; 76:14, 21; 78:1; 80:20; 86:22; 100:20; 102:9; 123:2; 130:2; 156:1, 7, 11; 171:2, 5; 172:25; 177:25; 179:3

8; 180:4, 10, 16; 187:3  
 Jordan [2] 183:18; 185:10  
 judgment [2] 6:12; 46:9  
 JUDICIAL [1] 183:6  
 July [1] 121:6  
 June [3] 121:5, 6  
 jury [3] 66:23; 97:9; 148:16  
 justified [1] 63:17

## - K -

keep [2] 11:18; 27:9  
 Kelley [5] 182:5, 20; 183:21; 184:1; 186:5  
 ketones [2] 150:4, 17  
 kidney [1] 150:11  
 kinds [5] 157:3, 6, 7; 158:1; 161:1  
 knowing [1] 18:8  
 knowledge [6] 13:23, 25; 30:3; 86:2, 10; 137:13

## - L -

Le-n-z [1] 84:24  
 L.L.P. [2] 185:12, 22  
 lab [3] 160:14; 176:8  
 Labor [1] 136:11  
 laboratories [1] 159:23  
 laboratory [1] 160:3  
 labs [1] 161:21  
 Lack [1] 167:1  
 lack [2] 43:14; 175:5  
 large [4] 67:25; 68:2; 144:8; 175:15  
 larger [2] 29:1, 2  
 last [5] 25:22; 26:6; 53:8; 65:20; 177:7  
 lasting [1] 155:11  
 Lastly [1] 102:13  
 latency [2] 38:22; 90:22  
 Law [2] 185:11, 21  
 law [1] 143:18  
 lawsuit [1] 6:5  
 lawsuits [2] 175:25; 177:2  
 lawyer [1] 24:12  
 lead [1] 42:7  
 leading [1] 90:25  
 learned [1] 60:23  
 leaves [1] 110:21  
 leaving [3] 18:4; 39:7; 40:16  
 legal [1] 24:10  
 length [1] 59:17  
 Lenz [1] 84:24  
 level [45] 53:5, 6, 12, 15, 17; 54:9, 10; 56:2, 7; 57:5, 21; 58:21; 79:24; 89:1, 16; 91:12, 20; 92:1, 20, 24; 93:17; 94:1; 95:9, 24; 96:16, 23; 105:14; 131:17, 24; 132:3; 134:11; 138:17, 18; 139:1; 142:16; 144:15; 145:17; 146:5; 147:10, 18, 24; 148:4, 8; 162:19  
 levels [19] 44:21; 67:7; 81:12; 82:9; 88:17; 89:22; 97:3; 113:12; 114:10; 116:2; 136:10, 16; 137:10, 11, 18; 142:3; 144:22; 146:3; 175:6  
 library [6] 32:16, 24; 33:2, 13; 35:14; 179:12  
 Librax [1] 172:20  
 life [9] 20:16; 21:17; 23:18, 23; 24:15, 17, 18, 19; 79:1  
 Life-style [1] 43:4  
 life-style [15] 43:6, 9, 10, 18; 44:18, 19, 22, 24; 45:7; 46:20, 25; 47:7; 52:1, 17; 170:7  
 likelihood [4] 149:12; 153:18, 23; 154:2  
 limit [5] 89:7, 9; 95:16; 136:20; 147:17  
 limitation [1] 105:11  
 limitations [1] 67:22

limited [2] 55:19; 145:21  
 linkage [1] 56:24  
 list [32] 4:15; 25:14; 31:22; 35:18; 36:10, 13, 16; 37:9; 52:8; 72:19, 21; 73:5, 6, 7, 13; 74:4, 25; 75:7; 76:6, 20; 103:9, 12; 111:16; 117:15; 159:15; 163:4; 164:9; 165:15; 173:14; 178:17; 187:15  
 listed [22] 29:7, 11; 30:13; 36:7; 37:12; 71:1, 18; 116:8; 117:18; 120:11; 127:25; 128:1; 129:3; 132:7; 134:17; 140:12; 147:10; 149:12; 154:16; 164:22  
 lists [1] 5:15  
 liter [1] 141:6  
 literature [32] 31:20; 32:2; 33:8, 18; 34:14; 35:6, 10; 38:8; 39:13; 40:3, 8; 56:22; 57:2, 3; 58:2; 63:25; 79:21, 23; 91:25; 92:15, 18; 93:16, 25; 94:20; 98:14; 138:12; 139:12, 14; 154:6, 8, 19; 155:17  
 liters [1] 141:7  
 Liver [2] 37:2; 125:23  
 liver [11] 32:19; 124:11; 150:11; 168:19; 169:1, 3; 172:16, 21; 173:8, 14, 18  
 looks [9] 27:10; 37:16; 74:4, 24; 117:2; 120:6; 121:23; 176:9; 180:6  
 Lortab [4] 100:12, 13; 101:2; 172:6  
 Loss [2] 125:1; 168:5  
 loss [22] 124:23; 125:15, 17; 126:11, 17, 19; 127:1, 7, 10, 14, 16, 20; 128:9, 19, 21; 130:24; 131:7, 8, 13; 166:21; 168:4, 17  
 lost [1] 168:9  
 lot [15] 3:19; 4:2, 20; 12:14; 42:11; 61:22; 92:21; 130:11; 143:13; 166:7; 171:7; 173:20; 174:10; 175:3, 5  
 Loud [1] 23:20  
 loud [2] 23:19; 37:18  
 low [10] 44:11; 59:14; 67:4, 5, 24; 68:3, 6, 7, 25; 69:4  
 lower [11] 67:15, 16; 68:5; 93:2, 3; 105:8; 144:2, 3; 148:9; 166:7, 9  
 Lubrizol [1] 177:19  
 lumped [1] 154:24  
 Lunch [1] 69:18  
 lunch [5] 5:8, 11; 33:11; 61:8; 73:19  
 lunchtime [1] 10:9  
 lung [10] 66:7, 9, 13; 88:18; 94:8; 105:23; 106:10; 109:16; 174:17  
 lungs [2] 105:22; 110:22

## - M -

magnitude [1] 57:20  
 mailed [1] 185:3  
 main [3] 42:8; 133:22; 136:14  
 Mainly [1] 133:9  
 mainly [7] 36:18; 114:1, 8, 25; 124:10; 134:9  
 majority [2] 176:23; 177:9  
 male [1] 39:15  
 males [1] 39:14  
 malodors [1] 21:24  
 manifest [1] 100:5  
 manner [1] 133:18  
 manual [2] 161:4, 11  
 manufacturers [1] 90:15  
 manufacturing [1] 90:20  
 Marcaine [1] 172:19  
 March [3] 121:24; 122:1, 2  
 MARINE [1] 183:3  
 Marine [1] 6:18  
 marked [15] 3:25; 29:17, 18; 31:6; 74:16; 76:19; 117:19; 156:9; 180:2; 187:6, 8, 11, 15, 18, 24

Martin [1] 3:9  
masters [1] 12:9  
material [7] 19:3; 30:6; 18; 89:25; 123:4;  
143:24; 145:2  
materials [6] 4:17; 10:8; 15:3; 23:10; 144:18;  
179:15  
matter [5] 7:7; 25:23; 70:2; 182:15; 184:5  
matters [2] 26:2, 11  
Maynard [1] 185:12  
McCallum [3] 182:21; 183:22; 186:6  
McDowell [4] 11:8; 13; 177:18; 185:22  
McKinney [2] 183:14; 185:23  
mean [98] 4:25; 6:20; 7:13; 16; 9:24; 11:19;  
13:6; 15:7; 18:1; 19:11; 21:25; 23:11; 24:13;  
14; 18; 27:25; 30:10; 36:2; 37:1, 3; 38:17, 23;  
45:11; 46:8; 47:10; 50:11; 51:6; 56:13; 58:16;  
60:5; 63:18; 69:14; 71:12; 20; 72:4, 20; 78:24;  
25; 79:1,  
6, 19, 25; 82:8; 83:5; 84:22; 86:13; 87:2; 89:8;  
9; 93:5; 94:4, 12; 98:3; 100:5; 103:4, 20;  
106:2, 24; 107:21, 22; 108:10; 109:21; 110:7,  
25; 118:14, 23; 126:24; 128:17; 131:8, 13;  
135:3; 139:8, 22; 141:20; 142:5; 143:23;  
148:16, 18; 149:11, 18; 151:16; 153:23;  
154:1, 8, 10; 155:6; 157:9, 13, 14; 160:14, 21;  
162:21; 163:16; 168:23; 173:11, 15; 175:7;  
176:23  
meaningful [2] 92:9; 108:17  
means [10] 65:24, 25; 70:24; 97:11; 107:3;  
137:16; 151:17; 155:12; 169:5  
meant [4] 19:6; 25:3; 33:22; 39:19  
measure [2] 69:4, 5  
measurement [1] 158:15  
measures [1] 158:17  
mechanism [2] 65:17; 111:1  
Mecizine [1] 50:21  
mecizine [2] 49:24; 50:15  
Medical [1] 12:16  
medical [55] 6:13; 13:4; 18:4; 23:12; 24:4, 6;  
30:23, 24; 31:1; 37:22; 43:1, 16, 17; 44:14;  
45:23; 46:8; 47:1, 2; 48:8, 11; 49:7, 16; 51:2;  
52:1, 13, 16, 22; 53:3; 54:7; 56:10; 57:6, 24;  
58:18; 61:23; 62:3, 6; 63:25; 65:14, 21; 96:12;  
115:3;  
144:21; 150:14; 153:1, 3, 5, 6; 167:23; 168:21;  
169:2, 22; 170:4; 171:7; 173:1, 5  
medication [7] 52:11; 98:23; 99:13; 100:12;  
128:22; 170:13; 174:12  
medications [9] 49:21; 52:8; 129:3; 171:9, 11;  
174:2, 4; 175:14, 16  
medicine [3] 84:20, 23; 85:2  
meet [2] 14:4  
meeting [1] 14:1  
membranes [1] 101:25  
Memorial [3] 182:22; 183:23; 186:7  
memory [9] 10:10; 13:16, 19; 82:19; 83:10;  
154:25; 155:11; 160:25; 161:10  
mental [2] 154:14, 15  
mention [3] 23:19; 52:6; 175:13  
mentioned [25] 13:1; 18:16; 42:19; 48:14;  
50:7, 16; 52:3; 70:7; 73:2; 77:24; 82:2; 91:6;  
95:13; 96:25; 104:14; 111:23; 136:4; 150:14;  
152:23; 153:12; 165:1; 170:5; 174:15; 178:10;  
179:11  
metabolite [1] 158:23  
metabolites [1] 158:21  
metabolized [1] 158:14  
metal [21] 70:11, 17; 71:13; 72:3, 10, 13;  
111:4, 6, 10, 14, 18, 20, 22, 25; 112:3, 8, 14;  
113:25; 114:3; 115:20  
metals [17] 70:19; 71:17; 111:4; 112:17, 24;

113:1, 5, 14, 18, 22; 114:11, 14; 115:4, 10, 12,  
23; 116:1  
meter [2] 89:5, 19  
meters [1] 20:1  
method [5] 41:21, 22; 67:20; 126:14; 133:10  
methylchloroform [2] 165:10; 173:10  
mice [1] 64:24  
Michael [1] 185:20  
micrometer [1] 90:24  
Milby [1] 94:11  
mile [1] 19:9  
miles [1] 56:14  
milligrams [1] 89:4  
million [13] 89:5, 18; 140:14, 19, 22, 23, 24,  
25; 141:1, 5, 7, 14, 16  
mind [3] 40:17; 120:23; 145:7  
mine [2] 34:18; 90:1  
miner [1] 85:12  
miners [1] 98:16  
minimal [1] 147:15  
minimum [2] 66:19; 91:12  
mining [2] 90:18; 107:1  
minor [2] 10:15; 11:1  
minutes [1] 61:14  
misinterpret [1] 145:3  
missed [1] 21:2  
misstating [1] 32:3  
mistaken [1] 31:25  
misunderstood [1] 19:16  
mixture [1] 148:21  
mixtures [1] 154:6  
model [1] 64:9  
moderate [1] 99:19  
modified [2] 146:11; 178:17  
molecules [1] 152:16  
moment [1] 94:16  
monitoring [3] 79:18, 19; 132:1  
monkey [1] 64:3  
months [7] 5:25; 86:10; 90:22; 97:12, 16;  
109:9; 121:23  
Mostly [1] 114:22  
mostly [2] 42:5; 146:16  
mothers [1] 144:8  
Motrin [1] 172:6  
move [2] 69:20; 79:3  
moved [2] 15:1, 16  
Mrs [17] 14:2; 17:22; 20:14; 34:12; 44:16;  
45:8; 49:6; 70:1; 76:1, 12; 98:22; 99:12;  
100:11; 102:23; 128:21; 170:12; 171:8  
MS [1] 12:9  
Ms [2] 87:8; 168:24  
mucous [1] 101:25  
multiple [1] 98:8  
multiplicative [2] 66:16; 148:25  
Muscle [1] 125:15  
muscle [1] 125:15  
muscular [1] 124:12  
music [1] 74:16  
Mylicon [2] 172:6, 20  
Myoclonus [1] 167:7  
myoclonus [1] 167:5  
myself [1] 11:4

# - N -

N-butanol [4] 120:14, 17; 134:23; 165:8  
name [4] 3:7; 35:1; 82:20; 164:23  
names [3] 155:21; 161:13, 16  
Naprosyn [1] 172:7  
National [2] 84:2; 136:12  
nature [3] 103:24; 111:8; 112:20

Nausea [1] 125:13  
nausea [3] 175:8, 10, 15  
nearby [1] 54:20  
needs [4] 55:2; 57:4; 89:17; 92:20  
negative [3] 151:14; 152:5, 11  
Neil [3] 182:21; 183:22; 186:6  
nervous [7] 37:4; 100:3; 118:18, 19; 154:13,  
23; 159:18  
neural [1] 162:14  
neurochemical [1] 116:14  
neurological [4] 32:19; 81:18; 124:11, 15  
neurotoxic [10] 36:20, 23; 37:3; 116:15;  
117:10, 17, 25; 118:13; 124:4; 154:11  
Neurotoxicity [3] 116:22; 117:12; 155:10  
neurotoxicological [1] 162:23  
neutralization [2] 152:18, 20  
nine-year [1] 86:15  
NIOSH [6] 12:18; 83:24; 84:1, 8; 136:12;  
138:6  
Nobody [1] 11:15  
Nocturnal [1] 167:5  
noise [2] 23:6; 178:4  
noises [6] 23:19, 20; 37:19; 127:18; 128:8;  
131:2  
noncancerous [1] 57:12  
noncarcinogenic [1] 147:14  
noncrystalline [1] 90:14  
nonplausibility [1] 39:17  
nonpolar [2] 134:19, 25  
nonsmoking [1] 66:14  
nonworkers [1] 144:23  
normal [8] 136:23; 150:4; 165:7, 17, 21, 25;  
166:4, 5  
normally [5] 24:2, 20; 88:10; 163:24; 164:2  
NORMAN [2] 3:1; 183:11  
Norman [4] 3:9; 181:3, 13, 19  
Notary [2] 181:9, 23  
noted [8] 13:24; 31:11; 49:14; 152:4, 24;  
153:19; 172:4; 181:8  
notes [12] 5:14; 9:13; 10:2, 12; 35:23; 36:1, 5;  
47:25; 73:11; 100:15; 116:18; 117:8  
notice [4] 4:1; 29:18; 116:9; 187:8  
November [6] 14:8; 17:3, 4; 121:11, 25  
noxious [3] 37:20; 75:4; 122:21  
nuisance [9] 20:15; 21:14, 23; 23:3, 5, 17;  
24:12, 13, 23  
number [21] 67:25; 68:1, 2; 92:9, 25; 93:3;  
120:11; 124:14; 131:21; 143:7; 144:8; 155:8;  
160:2; 164:4; 165:1; 169:15; 170:23; 172:4;  
173:8; 175:16, 21  
numbers [3] 94:18; 160:25; 161:10  
Numbness [1] 125:19  
numerous [3] 75:6; 154:20; 155:4

# - O -

O'Donoghue [1] 116:24  
Oak [1] 185:13  
obesity [1] 43:14  
objections [1] 147:8  
objective [1] 79:14  
observe [2] 67:24; 68:2  
observed [9] 52:24; 53:5; 54:9; 56:11; 62:5;  
65:16, 23; 132:15, 18  
obtain [2] 83:4; 84:13  
Obviously [3] 41:3; 170:23; 178:24  
obviously [10] 42:25; 56:13; 60:22; 93:15;  
109:21; 129:4; 164:18; 168:24; 169:19; 175:5  
occupation [1] 85:8  
Occupational [3] 84:2; 136:12; 145:25  
occupational [11] 80:1; 83:25; 84:20, 23;

85:2; 88:16, 18; 92:23; 98:14; 106:10; 142:20  
 occupations [1] 92:23  
 occur [5] 38:23; 64:15, 25; 65:7; 91:8  
 occurred [10] 28:2; 41:1, 24; 56:1, 20; 59:17;  
 110:22; 114:18; 182:7  
 occurrence [5] 42:3, 11, 20; 51:25; 52:17  
 occurring [1] 56:24  
 occurs [6] 42:22; 64:14, 16, 19, 24, 25  
 October [3] 121:10, 11  
 odor [2] 122:21, 22  
 odors [6] 23:6; 37:20; 75:4; 122:19; 128:8;  
 132:15  
 offhand [4] 143:9; 161:15; 162:22; 164:6  
 office [2] 27:3; 35:24  
 Oh [14] 14:11; 18:17; 19:15; 25:10; 55:18;  
 61:20; 107:1; 109:6, 19; 139:8; 141:12; 165:8;  
 176:12, 23  
 oh [2] 150:9; 176:6  
 Okay [323] 3:18; 4:7, 20, 24; 5:9, 19, 20; 6:1,  
 7, 14, 20, 23; 7:2, 6, 15; 8:8; 9:3, 9, 16, 21;  
 10:1, 6, 16, 18, 21; 11:15, 21, 22; 12:3, 6, 11,  
 21; 13:14, 19; 14:4, 12, 15; 15:16; 17:10, 12,  
 16, 20, 24, 25; 19:16; 20:18; 21:10; 22:18;  
 23:4,  
 23; 24:3, 8, 16; 25:14, 17; 26:23; 27:1, 4, 7;  
 28:3, 10; 29:4; 30:16, 25; 31:10, 25; 32:8, 14,  
 23; 33:21; 34:2, 19; 35:1, 9, 23; 36:10, 24;  
 37:6; 38:6, 15; 39:18, 20; 40:5, 15, 21; 43:15,  
 24; 46:16; 48:1, 7; 50:1, 13; 51:23; 52:15;  
 53:8, 25; 54:12; 55:10;  
 61:2, 17; 62:10; 63:21; 64:11, 18; 65:8, 20;  
 66:23; 67:12; 68:10, 13, 17, 23; 69:5, 12, 22;  
 70:4, 19, 23; 71:4, 8, 19; 73:24; 74:11, 23;  
 78:6, 9; 79:5; 80:3; 81:7, 16, 20, 25; 82:2, 14,  
 25; 83:5, 13; 84:4, 12, 14; 86:1, 4, 17; 87:8,  
 16, 20, 24; 88:8, 22, 25;  
 90:2; 93:21; 94:23; 95:19; 96:20; 97:3, 9, 14,  
 18; 98:6, 10, 17; 99:4, 7, 12, 22; 100:7, 21, 24,  
 25; 101:17, 21, 24; 102:5, 10, 13, 18, 22;  
 105:24; 106:12, 15, 17; 107:2; 108:4, 9, 14,  
 21; 109:8, 10, 14, 17, 20; 110:10, 24; 111:3, 6,  
 13, 16; 112:2; 113:11,  
 18; 114:9, 19; 115:2, 9, 116:7, 11, 12, 17;  
 117:2, 19; 118:13, 15, 20, 22; 119:11, 23;  
 120:3, 16; 121:3, 25; 122:3; 124:4, 22; 125:1,  
 13, 19, 25; 126:9, 14; 127:23; 129:8, 11, 17,  
 20; 130:3, 8, 17, 20; 131:16, 22, 25; 132:5, 16,  
 19; 133:2, 23; 135:1; 136:4,  
 15; 138:24; 139:3, 6, 10, 22; 140:3, 17;  
 141:15, 22; 142:18, 22; 143:5, 10; 145:14, 24;  
 146:12, 15; 147:3; 148:1, 11, 18, 24; 149:4;  
 150:8, 22; 151:4, 25; 152:8, 11, 19, 22;  
 153:15; 154:10; 155:8, 20; 157:20; 158:4, 12,  
 18; 159:7, 10, 12, 17; 160:9; 161:12,  
 17, 22; 162:9; 163:2, 21; 166:13; 167:15;  
 168:5, 18; 169:22, 25; 170:15, 16, 18; 171:2;  
 172:3; 176:3; 177:1, 6, 16; 178:1, 19, 24;  
 179:19; 180:4, 16  
 okay [6] 25:10; 71:14; 73:20; 87:2; 91:21;  
 100:24  
 olfactory [4] 54:25; 56:3; 155:2  
 on-the-job [1] 12:14  
 one-one [2] 142:15, 16  
 ones [17] 68:5; 72:25; 73:1; 74:12; 83:10;  
 153:11, 13; 154:21; 158:8, 10; 159:4, 14, 15;  
 162:23; 164:2, 7; 165:14  
 operation [18] 14:18, 24, 25; 15:2; 16:1;  
 21:23; 23:7, 8; 24:14; 70:20, 22; 78:25; 79:1;  
 104:6; 111:7; 166:12; 169:4  
 operations [5] 23:25; 25:15; 86:7; 117:16;  
 127:18

opine [1] 126:15  
 opinion [25] 23:4; 37:17; 46:11; 49:17; 51:8,  
 9, 20; 58:13; 96:5, 12; 97:18; 103:14; 110:16;  
 114:17; 115:2; 119:19; 131:6; 135:19; 141:23,  
 24; 146:22; 147:9, 21; 153:18; 156:17; 171:12  
 opinions [11] 25:9; 26:1, 10; 27:21; 35:20;  
 36:17; 49:8; 51:5; 60:25; 110:5; 133:19  
 opposed [7] 85:11; 97:25; 144:24; 172:13;  
 174:3; 176:10, 17  
 opposition [1] 147:5  
 Oradol [1] 172:7  
 oral [1] 133:14  
 order [16] 4:14; 48:9; 50:23; 55:2; 57:6; 58:17;  
 60:11; 68:2; 94:2; 96:1; 126:15; 131:19;  
 167:21; 168:20; 169:16, 20  
 orders [1] 57:20  
 organ [1] 64:8  
 organic [18] 70:11, 17, 23; 71:13; 72:15; 74:9,  
 17; 75:24; 76:20; 111:18; 116:8; 132:6;  
 134:17; 135:16; 140:6, 11; 187:16  
 organized [1] 27:10  
 original [4] 9:25; 158:24; 184:25; 185:2  
 Orudis [1] 172:7  
 OSHA [5] 136:11; 145:24; 146:8, 20, 23  
 outdoor [2] 165:18, 19  
 outdoors [1] 165:24  
 outside [1] 139:7  
 overlap [4] 39:4; 44:19; 73:1; 74:25  
 overlaps [2] 38:13; 40:1  
 oxygen [1] 106:20

# - P -

P-r-i-l-l-o-s-e-c [1] 101:6  
 packers [1] 90:16  
 page [18] 20:12; 21:6; 25:12; 37:14, 17; 90:6;  
 94:9, 18; 95:14; 150:25; 156:9, 12, 13, 14;  
 179:7, 10; 187:18, 22  
 pages [6] 74:8, 17; 117:4; 121:17, 19; 164:9  
 Pain [1] 167:9  
 pain [1] 99:19  
 pains [1] 181:4  
 pair [1] 150:6  
 paper [3] 35:24; 74:4; 181:8  
 papers [2] 36:5; 138:12  
 parameters [1] 49:11  
 parlance [1] 137:2  
 Parsons [1] 185:12  
 part [20] 20:20; 24:24; 34:24; 39:9, 10; 40:21;  
 43:8; 52:12; 66:4, 18; 89:18; 140:14, 18, 19,  
 22, 23, 24, 25; 141:4  
 particle [1] 91:3  
 particles [6] 23:7; 90:23; 91:13; 140:20;  
 141:5, 16  
 particulate [2] 133:16, 17  
 parties [3] 182:14; 184:3; 185:18  
 partly [5] 24:5; 39:23; 63:22; 124:11; 151:22  
 parts [7] 79:14; 80:22; 89:5; 131:18; 141:1,  
 14, 15  
 party [2] 184:16; 185:7  
 pathology [3] 38:11; 39:9; 40:11  
 PEL [3] 146:5, 8, 19  
 PELs [2] 146:3, 23  
 penalties [1] 181:4  
 people [23] 42:11; 44:20; 52:2; 53:18, 20;  
 58:23; 59:2, 21; 62:8, 14; 63:8; 64:10; 76:5;  
 78:11; 82:9; 85:11; 93:3, 6; 105:2, 12; 127:7;  
 144:9; 171:18  
 percent [13] 63:19; 65:2; 126:16, 18; 153:23;  
 174:3, 24, 25; 176:24; 177:4, 8  
 percentage [3] 65:5; 176:15, 19

perform [2] 6:4, 9  
 performance [4] 159:24, 25; 160:22, 23  
 period [15] 20:15; 21:13; 38:22; 49:20; 50:3;  
 77:9; 86:15; 90:22; 97:11, 12; 120:24; 122:14;  
 144:24; 145:18  
 periodic [1] 87:13  
 periods [3] 97:16; 113:12; 119:1  
 peripheral [2] 37:5; 118:18  
 perjury [1] 181:4  
 permissible [4] 136:9, 16; 146:2, 5  
 permit [3] 38:10, 11; 39:8  
 permitted [1] 138:19  
 person [33] 11:5; 39:16; 41:4; 48:17, 19;  
 52:24; 53:5; 54:9; 56:8, 12; 57:2, 4, 16, 22;  
 58:21; 59:8, 15, 16; 60:9, 21; 63:15; 65:16, 24;  
 69:7; 89:10, 18; 104:15, 17; 133:15; 142:6;  
 163:1  
 personality [1] 155:1  
 personally [2] 15:6; 30:22  
 perspective [1] 173:25  
 petroleum [1] 164:17  
 Ph [1] 12:9  
 Ph.D. [6] 3:1; 12:10; 181:3, 13, 19; 183:11  
 pharmacology [1] 13:3  
 phenol [4] 158:14, 16; 159:6  
 Philadelphia [1] 12:15  
 philosophy [1] 143:24  
 physical [4] 15:13; 30:17; 32:11; 49:9  
 pick [1] 158:8  
 pictures [1] 15:8  
 pieces [1] 94:20  
 place [4] 55:22; 61:12; 78:23; 181:6  
 Plaintiff [2] 176:6; 183:19  
 plaintiff [5] 39:16; 177:2, 4, 8, 10  
 plaintiffs [2] 42:14; 114:20  
 plan [1] 178:21  
 plans [1] 51:11  
 plant [2] 54:20, 23  
 plausibility [5] 39:1, 10, 11, 21; 40:12  
 plausible [5] 38:12, 17; 40:6; 65:17; 172:13  
 please [1] 3:7  
 plume [1] 78:4  
 plus [1] 23:9  
 pneumoconiosis [1] 94:11  
 pneumoconiosis [3] 88:18; 98:14; 112:18  
 point [19] 7:12; 31:21; 38:18; 40:2, 6; 53:8;  
 54:13; 69:10, 17; 74:7; 80:9, 21; 94:15;  
 121:19, 20; 138:6; 144:11; 152:22; 173:4  
 pointed [2] 16:17; 130:1  
 points [2] 40:7; 102:23  
 polar [1] 134:23  
 political [1] 147:4  
 pollutants [1] 166:11  
 pollution [4] 82:22, 23; 83:9; 166:8  
 polyneuritis [1] 154:15  
 population [2] 105:1; 144:5  
 portion [2] 44:18; 90:9  
 positive [1] 60:22  
 possession [2] 4:18; 9:19  
 Post [1] 185:13  
 post-traumatic [1] 167:19  
 postage-paid [1] 185:4  
 potential [10] 66:2; 126:10, 15; 127:13; 128:4;  
 166:16, 22; 167:22; 168:6; 169:16  
 potteries [1] 90:18  
 powders [1] 90:16  
 practice [1] 137:18  
 preceded [1] 104:6  
 precise [3] 52:8; 57:21; 133:21  
 Precisely [1] 60:12  
 precisely [4] 19:10; 88:5; 94:5; 133:6

predated [1] 15:21  
 predating [1] 169:3  
 predict [2] 53:15; 104:16  
 preexisted [3] 45:15, 19; 46:6  
 preexisting [9] 24:25; 41:3, 6; 43:2; 45:25;  
 46:12; 48:14, 15; 49:4  
 prefer [1] 157:17  
 Preferably [1] 65:11  
 pregnant [1] 144:8  
 preliminary [1] 70:2  
 preparation [2] 36:18; 184:11  
 prepare [2] 11:2; 35:19  
 prepared [5] 11:4; 25:20; 26:25; 27:2; 35:18  
 preparing [1] 31:19  
 prescribed [1] 50:3  
 presence [1] 162:24  
 present [8] 92:6; 138:19; 164:11, 12, 13, 14;  
 165:22  
 Press [2] 116:25; 117:3  
 pressure [1] 42:17  
 presumably [4] 24:21; 79:13; 127:7; 160:3  
 presume [3] 104:1; 118:24; 127:5  
 presuming [2] 8:12; 120:2  
 pretty [7] 52:7; 69:6; 80:16; 149:14; 157:24;  
 160:13; 170:8  
 previous [4] 43:1; 51:2, 25; 105:7  
 Prilo [1] 101:6  
 Prilosec [4] 101:6, 9; 171:16; 172:7  
 primates [1] 64:6  
 principally [1] 4:3  
 principle [6] 54:3, 15; 55:16; 58:16, 17; 68:10  
 principles [1] 157:18  
 prior [15] 9:16, 19; 10:7, 11, 13; 34:22; 35:7;  
 41:5; 44:5; 50:25; 60:2; 104:2; 169:6; 180:5  
 probability [13] 52:22; 53:3; 54:8; 56:10; 57:6;  
 24; 58:18; 61:23; 62:4; 65:14, 22; 126:18;  
 153:24  
 problem [19] 38:21; 43:20; 48:25; 52:10; 60:2;  
 80:13; 99:8; 103:24; 107:13; 113:19; 140:5;  
 166:20; 168:13; 172:1, 3, 13, 16; 174:10  
 problems [87] 6:13; 14:21; 15:12; 23:14;  
 37:22; 39:14; 43:7, 9, 20; 45:13, 14, 19; 46:5;  
 47:1; 48:18, 20; 49:24; 53:16, 22; 60:9; 81:18,  
 19, 22, 24; 88:11, 12, 14, 15; 89:2; 92:2, 17;  
 93:7; 94:3; 97:21, 24; 98:3, 11; 103:1, 15, 19,  
 22; 104:2;  
 4; 112:9, 10, 16, 17, 20; 113:13, 20, 24; 114:1;  
 124:4, 11, 12, 15, 17, 22; 125:5, 23; 126:16;  
 127:25; 128:20; 131:7, 12; 153:3, 5, 7; 158:3;  
 162:18, 20; 166:14; 167:11; 168:19; 169:1, 3;  
 171:19, 20; 172:21; 173:8, 14, 18; 174:13;  
 178:5  
 Procedure [2] 184:6; 185:17  
 procedure [1] 109:22  
 proceedings [2] 182:7, 11  
 process [2] 86:13; 127:17  
 produce [1] 67:21  
 produced [9] 9:4, 5, 6, 9; 17:7, 8; 18:20; 26:7,  
 19  
 produces [1] 62:18  
 producing [2] 90:20; 147:6  
 product [1] 149:3  
 production [1] 17:7  
 products [1] 164:17  
 professor [3] 11:22; 12:12; 38:2  
 profiles [1] 83:17  
 propanol [2] 150:10; 173:10  
 properly-addressed [1] 185:4  
 properties [7] 31:23; 32:11; 36:20, 21, 22, 23;  
 37:1  
 protect [4] 137:7; 138:20; 139:19, 21

protected [2] 138:22; 144:7  
 protecting [2] 137:17, 19  
 protection [1] 144:9  
 protective [4] 78:13; 98:15; 146:24; 148:10  
 provide [2] 98:15; 140:2  
 provided [1] 51:16  
 proviso [3] 62:11, 22; 76:6  
 psychological [3] 127:2, 22; 160:23  
 psychomotor [1] 155:12  
 Public [2] 181:10, 23  
 publication [2] 179:6; 187:21  
 published [4] 35:4; 117:2; 156:2  
 pulled [1] 155:16  
 pulmonary [5] 110:8, 20; 112:9; 162:20  
 purely [2] 86:24; 118:4  
 pursuant [2] 184:5; 185:16  
 putting [1] 40:13

## - Q -

qualification [5] 54:3, 15; 55:14, 15, 17  
 qualifications [1] 55:18  
 qualified [1] 69:2  
 qualify [3] 54:14, 16; 76:9  
 Quality [1] 24:19  
 quality [7] 20:16; 21:16; 23:18, 23; 24:15, 17,  
 18  
 quantity [3] 38:10; 39:8; 40:10  
 question [33] 12:7; 22:4; 24:16; 26:4; 38:20;  
 40:4; 44:23; 48:24; 62:7; 63:2; 66:9; 79:7;  
 80:13, 17, 19; 89:13; 92:4; 93:9, 11; 94:6;  
 96:5, 21; 98:25; 110:13; 118:2; 120:23;  
 126:24; 139:17; 145:11; 161:6; 163:22; 185:8  
 questions [7] 42:15; 49:3; 52:7; 61:24; 91:17;  
 95:5; 180:17  
 quick [4] 76:16; 155:22; 171:2; 180:7  
 quickly [4] 25:2; 101:1; 168:4; 171:10

## - R -

R-Gen [1] 172:8  
 R-u-T-u-s [1] 101:22  
 rabbit [2] 64:9, 13  
 rabbits [1] 63:4  
 random [1] 63:24  
 range [1] 68:21  
 rapid [1] 67:6  
 Rapidly [1] 90:15  
 rapidly [1] 90:21  
 rat [1] 64:2  
 rate [4] 6:25; 7:2; 58:3, 4  
 rats [1] 64:25  
 reaction [3] 88:23; 90:25; 162:17  
 read [3] 84:10; 150:16; 155:21  
 reading [2] 12:17; 139:14  
 real [2] 25:2; 155:22  
 reason [4] 54:1; 69:2; 92:23; 180:12  
 reasonable [17] 38:18; 40:13; 52:22; 53:3;  
 54:7, 21; 56:10, 20; 57:6, 24; 58:17; 61:23;  
 62:3; 65:14, 21; 96:12; 115:2  
 reasonably [1] 59:6  
 reasons [4] 54:5; 137:5; 172:2; 181:7  
 recall [4] 10:13; 30:14; 46:22; 47:23  
 receipt [1] 185:5  
 received [2] 5:23; 25:19  
 recent [1] 3:15  
 recently [1] 32:17  
 Recess [3] 123:1; 156:8; 171:4  
 recess [1] 69:18  
 recognize [2] 131:11; 135:4  
 record [19] 3:8; 29:14, 16; 61:19; 76:18;  
 94:17; 116:22; 122:24; 155:21; 156:5, 11;

179:3, 5; 180:8, 9; 182:14; 184:4, 9, 16  
 records [31] 25:5, 6, 23, 25; 26:8, 12; 27:12;  
 30:23, 24; 43:17; 44:14; 45:23; 46:9; 47:3;  
 48:8, 12; 49:7, 16; 51:2; 52:1, 13, 16; 122:8,  
 12; 167:23; 168:22; 169:22; 170:4; 171:8;  
 173:1, 5  
 recurrent [1] 56:21  
 reduce [1] 147:7  
 reduced [3] 79:3; 139:1; 162:19  
 reduction [2] 23:8; 137:15  
 redundant [1] 136:19  
 refer [8] 94:21; 107:6, 20; 127:24; 144:22, 25;  
 150:14; 155:5  
 reference [1] 94:7  
 references [8] 35:20; 37:8; 94:5; 139:15;  
 140:1; 151:3, 7; 156:14  
 referred [5] 25:11; 132:7; 139:8; 156:13;  
 167:19  
 referring [10] 6:16; 21:2; 90:6; 94:6, 18;  
 111:21; 117:4, 19; 121:16; 136:6  
 refers [1] 108:11  
 reflect [1] 106:3  
 regard [23] 26:1, 10; 27:23; 32:18; 34:18;  
 36:19; 64:1; 79:22; 83:9, 11; 89:23; 96:25;  
 98:10; 107:16; 128:3, 18; 144:22; 150:11;  
 151:1; 167:17; 170:12; 171:10; 179:16  
 Regarding [1] 53:8  
 regarding [3] 7:17; 131:7, 8  
 Registry [1] 83:16  
 regular [1] 7:3  
 related [8] 56:11; 77:17; 156:17; 171:14;  
 182:13; 184:2  
 relating [6] 52:23; 53:4; 54:8; 62:4; 65:15, 22  
 relationship [7] 57:7; 58:19; 63:11; 68:11;  
 149:8; 150:18; 152:12  
 relationships [3] 104:10; 105:13; 151:13  
 release [3] 21:24; 23:6, 10  
 released [5] 6:18; 25:15, 24; 122:19, 21  
 relied [14] 25:5, 25; 26:9; 27:19, 20; 35:25;  
 36:14, 17; 37:8; 79:21; 80:6; 156:16; 179:12,  
 24  
 rely [2] 25:8; 60:3  
 relying [3] 60:9; 62:1; 85:18  
 remain [1] 134:21  
 remains [2] 108:12; 110:23  
 remember [15] 13:7, 8, 11; 14:7, 9; 18:25;  
 19:3, 10; 35:7; 47:14, 22; 84:22; 123:7; 140:8;  
 179:16  
 remembered [1] 130:5  
 removal [1] 111:10  
 removed [10] 28:4, 15, 22; 29:8, 9, 12; 31:13,  
 14; 118:6; 119:22  
 renal [1] 151:2  
 rendering [4] 25:8; 26:1, 10; 27:21  
 repair [3] 144:12, 14, 16  
 repeatedly [1] 136:25  
 report [9] 9:6; 11:2, 16, 18, 19; 51:12; 70:6;  
 178:22; 180:12  
 reported [1] 154:5  
 REPORTER [2] 182:3; 183:1  
 Reporter [2] 182:6; 184:2  
 represent [1] 171:15  
 represented [1] 137:8  
 representing [2] 172:23; 173:3  
 request [2] 169:22, 24  
 requested [1] 185:5  
 requests [5] 4:5, 8, 12; 5:17; 17:7  
 require [1] 164:18  
 research [1] 148:7  
 reserve [1] 180:17  
 residence [3] 88:3; 123:7, 24

predated to residence

residual [1] 23:24  
 resistant [1] 53:19  
 Respiratory [3] 81:24; 88:12; 125:9  
 respiratory [44] 81:19, 25; 88:10, 14, 15, 20;  
 89:2; 92:2, 17; 94:3; 96:1; 97:21, 24; 98:3, 11;  
 99:7, 23, 25; 100:3, 4, 8, 23; 101:3, 9, 12;  
 102:2, 19, 24; 103:1, 14, 19, 21, 23, 24; 104:1,  
 4; 113:13, 20, 24; 114:1, 8; 128:20; 162:18  
 respond [2] 4:14; 105:8  
 response [15] 17:7; 25:20; 66:24, 25; 67:2, 4,  
 10, 13, 16; 105:3, 5, 6, 12, 16; 163:1  
 responsible [5] 6:12; 50:8; 59:19; 90:25;  
 174:3  
 responsive [3] 4:7, 17; 5:16  
 rest [1] 121:21  
 result [8] 26:18; 41:24; 42:22; 88:21; 97:20,  
 24; 103:4; 154:6  
 resulted [1] 28:18  
 results [2] 64:1; 105:2  
 retain [1] 176:11  
 retained [2] 176:4, 16  
 return [3] 184:17, 23; 185:5  
 returned [1] 185:2  
 reverse [1] 68:17  
 review [10] 17:8, 22; 26:19; 29:24; 30:1, 5, 11;  
 50:16, 22; 81:11  
 reviewed [23] 16:10; 17:10, 14, 18; 18:4, 9,  
 15; 22:10, 15; 25:4, 23; 26:13; 30:14, 16, 20,  
 22; 33:24; 34:22; 50:10; 76:8; 82:4; 122:12;  
 145:7  
 reviewing [8] 17:6; 35:7; 43:16; 51:4, 6;  
 179:16  
 revised [7] 51:12; 137:12; 178:21; 180:12  
 rid [1] 111:1  
 Right [59] 6:3; 8:20; 16:20; 18:7; 20:17; 21:18;  
 22:14; 29:13; 34:10, 21; 41:12; 44:1; 45:6, 20;  
 46:3, 19; 51:3; 57:25; 61:1; 63:6; 64:6; 65:5;  
 67:22; 70:15; 72:12, 14; 77:17, 20; 79:12;  
 81:15; 85:10, 12; 93:13; 95:1, 4, 11; 105:18;  
 110:3;  
 113:10, 15; 114:18; 116:10; 118:1; 129:5, 23;  
 131:13; 132:11; 133:6; 146:4, 7; 152:14;  
 153:21; 154:20; 160:5; 165:5, 20; 173:7;  
 174:19; 175:9  
 right [72] 3:12, 23; 5:19; 6:15; 13:14; 16:24;  
 18:2; 21:4, 7; 34:3; 35:1; 36:13, 24; 42:1, 19;  
 45:22; 48:22; 51:11; 58:7; 59:20; 60:6; 61:18,  
 20, 21; 64:23; 70:24; 72:18; 73:11; 74:3; 75:3;  
 76:14; 95:20; 96:6; 97:6; 98:18, 21; 100:16;  
 101:8;  
 107:20; 112:1; 115:25; 117:5, 6, 7; 118:12, 13;  
 119:13; 121:5; 123:16, 18; 129:25; 133:9;  
 135:25; 140:1; 144:19; 145:16, 24; 146:3, 6;  
 148:2; 149:19; 151:20; 152:13; 153:15; 162:3;  
 163:21; 166:13; 169:1; 170:2, 16; 180:16  
 rigmarole [1] 3:23  
 risk [2] 48:18, 19  
 Robitussin-DAC [3] 101:15, 18; 172:7  
 rock [1] 90:17  
 rodent [4] 64:14, 16, 21; 65:1  
 rodents [1] 65:10  
 rotten [2] 54:19; 60:7  
 rough [1] 55:4  
 Roughly [1] 8:8  
 roughly [1] 66:12  
 route [5] 96:5; 107:8; 114:19; 133:7, 22  
 Ru-Tuss [7] 101:21, 25; 102:7; 129:21; 130:6,  
 10; 171:16  
 Rule [1] 184:6  
 rule [15] 43:7; 44:7, 9; 48:9, 20; 52:18; 126:15;  
 127:13; 128:4; 167:21; 168:1, 20; 169:14, 16,

20  
 ruled [3] 40:23, 24; 50:12  
 Rules [2] 184:6; 185:16  
 ruling [2] 51:24; 170:3  
 run [1] 44:20

# - S -

s-i-l-i-c-a-t-e-s [1] 106:22  
 S-shaped [1] 67:4  
 S-y-n-a-l-g-o-s [1] 171:17  
 safe [3] 142:1, 5; 143:3  
 safekeeping [1] 185:6  
 safer [1] 142:3  
 Safety [3] 84:2; 136:12; 145:25  
 safety [3] 91:20; 142:13; 143:14  
 salts [1] 106:20  
 sample [1] 109:15  
 sampling [1] 30:1  
 sandblast [1] 111:24  
 sandblasted [1] 71:21  
 sandblaster [2] 85:9, 12  
 sandblasters [3] 78:12; 90:16; 98:16  
 sandblasting [21] 15:4; 23:7, 8, 20; 37:19;  
 70:20, 22; 77:5, 6, 10, 18; 78:2, 5, 6, 22;  
 79:16; 86:7, 24; 111:7; 113:6; 114:18  
 satisfy [1] 157:19  
 save [1] 158:6  
 saying [52] 11:18; 15:5; 19:12; 21:14; 25:22;  
 27:17, 19; 39:3; 41:9, 20; 54:1, 6; 58:8; 60:20;  
 62:23; 67:18; 68:24; 70:7; 77:8; 79:11; 80:7;  
 81:2; 82:3; 85:20; 89:11, 20; 92:16; 103:5;  
 106:7; 109:25; 112:2, 13; 120:7, 22; 124:9;  
 127:6; 128:7;  
 132:5; 133:3; 135:6, 8; 142:2; 144:23; 145:5;  
 165:3; 173:4, 6, 13, 24; 175:19, 20; 176:10  
 scaming [2] 110:21, 22  
 scenario [1] 104:20  
 Science [1] 35:4  
 scientific [22] 36:5, 11, 14, 16; 52:22; 53:3;  
 54:3, 7; 56:10; 57:24; 58:18; 61:23; 62:4, 6;  
 65:14, 22; 96:13; 115:3; 144:21; 153:18, 22;  
 154:1  
 scientifically [1] 175:2  
 scores [1] 159:21  
 se [1] 63:8  
 Sean [2] 183:18; 185:10  
 search [2] 32:15; 33:18  
 searches [4] 31:20; 32:3, 6; 33:8  
 second [16] 5:20; 24:16; 29:14; 37:15, 17;  
 38:13; 61:19; 98:19; 122:25; 129:24; 150:21;  
 156:6, 21; 162:2; 172:22; 179:4  
 Secondly [1] 144:3  
 secondly [2] 53:12; 137:11  
 secretions [1] 102:1  
 semi-acute [1] 97:17  
 sense [3] 135:22; 161:23; 168:9  
 sensitive [3] 53:18; 93:6; 106:14  
 sentence [5] 20:23; 25:22; 26:6; 37:15, 17  
 separate [5] 19:19; 111:20; 126:22; 148:23;  
 181:8  
 separately [1] 151:19  
 September [7] 121:8, 9, 10  
 series [2] 37:22; 82:15  
 served [1] 185:18  
 Serviced [3] 31:8; 34:4; 187:13  
 serviced [3] 17:11; 18:10; 27:12  
 SERVICES [1] 183:3  
 Services [1] 6:19  
 seven [4] 87:6, 7; 97:2; 108:22  
 Severe [1] 125:17

severe [5] 53:22; 99:19; 112:20; 126:1; 173:8  
 severely [2] 20:15; 21:16  
 Shawn [5] 182:5, 20; 183:21; 184:1; 186:5  
 sheet [2] 74:16; 181:8  
 sheets [1] 74:4  
 shorten [1] 124:8  
 Shorthand [2] 182:5; 184:1  
 shortness [3] 99:5; 101:18; 102:11  
 shots [2] 49:23; 50:20  
 show [3] 91:19; 122:8, 9  
 shows [3] 63:25; 92:19; 118:5  
 sic [2] 39:15; 169:9  
 sick [1] 59:16  
 sigmoidal [1] 67:3  
 SIGNATURE [1] 181:1  
 signature [1] 184:17  
 significance [2] 152:12; 163:6  
 Significant [1] 60:17  
 significant [9] 20:6, 9; 48:12; 59:17, 21;  
 60:15; 100:10; 163:10; 180:14  
 signing [1] 181:9  
 Silica [1] 106:17  
 silica [91] 37:20; 70:8; 76:24; 77:7; 78:10, 16,  
 17, 21; 79:23; 80:2, 7; 81:5, 12, 17, 23; 82:7,  
 9, 13; 83:3, 4, 9, 11, 18; 85:1, 3, 22; 86:4, 5,  
 25; 87:22; 88:2, 9, 24; 89:1, 4, 23; 90:13, 23;  
 91:2, 15; 92:1, 6, 7, 17, 22, 24; 93:19; 94:1;  
 95:6; 96:2, 6, 14, 16, 18, 23; 97:10, 20, 25;  
 98:4, 5, 9, 10; 99:9; 104:12, 21; 105:14, 20,  
 25; 106:1, 8, 16, 19, 22; 108:2, 14, 16, 18;  
 109:2, 5, 13; 110:1, 4, 8, 15; 111:2, 9, 14, 17;  
 114:15; 149:5  
 silicate [3] 90:24; 91:3; 96:14  
 silicates [2] 106:18, 21  
 silicon [2] 106:17, 23  
 silicosis [4] 88:17; 90:12, 15, 18  
 simple [1] 137:5  
 simpler [2] 75:17; 159:1  
 simplest [2] 55:15; 143:12  
 single [4] 76:3; 92:9; 120:13; 153:12  
 Sinus [1] 125:5  
 sinus [5] 45:13, 14, 19; 46:5  
 SiO2 [1] 106:22  
 SiO3-2 [1] 106:18  
 sir [1] 71:10  
 sit [12] 95:19, 20; 119:13, 14; 135:10; 140:10;  
 146:17; 157:22; 158:9, 12; 163:15; 165:16  
 situation [2] 23:5; 139:14  
 six [2] 97:12, 16  
 size [1] 91:3  
 Skin [1] 126:3  
 skin [4] 168:20; 172:3, 10, 12  
 skins [1] 134:3  
 sleep [19] 124:23; 126:10, 17, 19; 127:1, 7, 9,  
 13, 16, 20; 128:9, 19, 21; 130:24; 131:7, 8, 14;  
 155:2; 166:21  
 sleeping [3] 24:1, 7; 126:23  
 slight [3] 55:8; 133:13; 160:8  
 slightly [1] 134:3  
 slow [1] 111:2  
 smell [9] 54:19; 55:2, 6; 56:17; 125:1; 168:4,  
 5, 9, 17  
 smelled [4] 55:25; 59:16; 60:7, 10  
 smelling [2] 55:23; 59:9  
 smelts [1] 127:19  
 smoke [2] 47:11; 48:2  
 smoked [1] 47:18  
 smoking [8] 43:13; 65:25; 66:7, 8, 11, 19;  
 174:15, 16  
 so-called [2] 57:9; 114:3  
 soap [1] 90:16

Soborg [1] 155:9  
 soda [2] 75:7; 152:15  
 sole [3] 66:20; 103:18; 171:1  
 solely [2] 118:8; 128:12  
 solemnly [1] 181:3  
 soluble [1] 29:2  
 Solvent [1] 155:9  
 solvents [4] 154:7, 21, 22; 168:16  
 somebody [10] 60:7, 13; 79:24; 81:13; 89:2;  
 92:12; 95:2; 99:8; 108:16; 172:11  
 someone [7] 42:4; 43:5; 92:19; 95:21; 104:10;  
 163:6; 174:12  
 somewhat [1] 57:16  
 somewhere [1] 19:25  
 sorry [22] 11:17; 13:6; 18:1, 17; 20:23; 22:2;  
 7, 23; 23:1; 25:11; 27:20; 43:17; 73:7; 75:13;  
 83:15; 98:19; 101:6; 139:22; 142:15; 144:13;  
 154:19; 160:18  
 sort [10] 26:21; 42:9; 79:14; 104:16; 111:8;  
 114:2; 123:15; 137:9; 154:23; 160:23  
 sound [1] 102:2  
 sounds [24] 12:22; 18:9; 22:8; 31:25; 32:1;  
 36:13; 39:3; 20; 45:20; 50:14; 51:4; 54:14;  
 58:1, 11, 15; 66:17; 95:9; 109:25; 113:20;  
 120:22; 144:17; 161:22, 25; 166:14  
 source [5] 88:7; 166:8, 10, 11, 12  
 sources [2] 106:24; 155:16  
 speak [2] 115:17; 116:1  
 speaking [2] 60:13; 162:6  
 species [6] 64:16, 19, 21; 65:1, 6; 68:1  
 specific [32] 13:19; 36:5; 52:24; 53:5; 62:5;  
 69:11; 70:18; 71:5; 72:1, 2, 18; 75:8; 77:22;  
 81:22; 82:14; 85:15, 17; 86:9; 87:17; 105:19;  
 25; 106:1; 124:3, 6, 17; 133:3; 135:1; 155:5;  
 156:23; 161:13; 163:18  
 specifically [15] 6:8; 12:13; 25:7; 69:23; 73:2;  
 75:8; 79:22; 83:9, 11; 88:13; 93:25; 132:20;  
 135:7; 163:9; 179:16  
 spectrophotometry [1] 107:14  
 spectrum [1] 121:13  
 spell [1] 102:15  
 spelled [1] 98:23  
 spend [1] 8:15  
 spoke [1] 43:15  
 spontaneous [1] 42:9  
 sputum [1] 109:15  
 stainless [1] 72:6  
 Standard [1] 161:10  
 standard [5] 82:22, 23, 24; 91:18; 161:9  
 standards [15] 80:1; 81:5; 142:8, 9, 20, 21;  
 143:12, 16, 20, 25; 145:11, 12  
 stapled [1] 71:1  
 start [11] 3:23; 11:16; 76:22; 113:11; 116:7;  
 117:23; 136:5; 142:11; 143:13; 150:13; 171:13  
 started [7] 14:25; 15:17; 48:22, 24; 60:8;  
 166:20; 169:6  
 starting [2] 5:6; 86:15  
 STATE [3] 181:16; 182:1; 183:1  
 State [3] 181:24; 182:6; 183:18  
 state [4] 3:7; 20:13; 131:1; 143:18  
 stated [3] 55:17; 181:7; 184:13  
 statement [3] 42:1; 47:25; 77:6  
 states [3] 142:10; 143:5, 6  
 stay [1] 148:19  
 steel [1] 72:6  
 Stella [4] 49:23, 24; 87:5; 172:23  
 stone [1] 90:19  
 street [1] 54:19  
 strenuous [1] 147:8  
 Stress [1] 166:24  
 stress [4] 44:8; 126:20; 127:3; 167:19

strive [1] 147:1  
 struck [1] 43:19  
 students [1] 13:5  
 studies [7] 65:3; 91:18, 24; 92:21; 93:15;  
 104:24; 144:21  
 study [3] 80:6; 104:24; 105:1  
 studying [2] 64:10; 159:24  
 stuff [5] 4:25; 5:1; 43:14; 161:4; 164:6  
 Styrene [1] 75:14  
 styrene [4] 37:21; 75:5, 11; 122:21  
 subject [1] 25:23  
 submitted [1] 184:15  
 subpoena [3] 4:1; 29:19; 187:9  
 subpoenaed [1] 176:9  
 Subscribed [1] 181:18  
 Substance [1] 83:16  
 substance [18] 57:12; 67:1, 10; 70:8; 76:11,  
 22; 77:1; 85:4; 88:2; 91:13; 95:3; 97:10;  
 108:12; 118:3; 123:5; 135:1, 19; 178:4  
 substances [24] 68:14, 19, 20, 24; 69:11, 24;  
 70:3, 18; 85:3, 16; 111:1; 132:9; 134:25;  
 135:8, 10, 16; 145:12; 149:6, 24; 152:4; 153:9,  
 19; 154:7; 156:18  
 substantial [2] 12:17; 120:11  
 substantially [2] 53:14; 93:3  
 successive [1] 109:16  
 suffer [1] 97:19  
 suffered [4] 6:11; 15:25; 20:14; 154:5  
 sufficient [5] 38:10, 22; 39:8; 40:10; 114:2  
 sufficiently [4] 31:23; 68:15; 132:13, 14  
 suggesting [2] 142:19; 150:16  
 suit [1] 177:23  
 suitable [2] 162:23; 163:19  
 Suite [5] 182:22; 183:14, 23; 185:23; 186:7  
 sulfide [2] 54:22, 24  
 sum [4] 148:22; 149:2; 151:18  
 summarize [1] 161:23  
 summary [1] 26:21  
 super [1] 84:16  
 support [5] 80:18; 81:2, 3; 82:6; 83:14  
 supports [2] 92:15, 16  
 suppose [1] 4:24  
 surprised [1] 47:24  
 susceptibilities [2] 58:23; 59:3  
 susceptibility [12] 53:13; 57:17; 91:5; 157:6,  
 13; 162:10, 11, 15, 16; 163:5, 11, 20  
 susceptible [1] 162:20  
 suspect [4] 75:11, 14; 114:4, 7  
 swallowed [1] 133:15  
 swear [1] 181:3  
 sworn [3] 3:2; 181:18; 184:7  
 Symmetrel [1] 130:13  
 symptomatology [1] 152:24  
 symptoms [14] 6:13; 23:9, 11; 40:4; 55:22;  
 59:13, 19; 62:15; 63:14, 15; 128:16; 154:4;  
 156:17; 171:11  
 Synalogs [2] 171:16; 172:8  
 syndrome [1] 167:3  
 synergism [8] 66:16; 149:11, 13, 18, 20, 25;  
 150:5, 7  
 synergistic [8] 91:4; 148:12, 17; 149:1, 3, 8;  
 150:15, 17  
 synonymously [1] 108:6  
 system [10] 37:4; 100:3; 107:25; 110:20;  
 115:13; 118:18, 19; 154:13, 23; 159:18  
 systems [1] 64:8

- T -

T-u-s-i [1] 172:8  
 table [5] 71:1; 116:16, 19, 20; 117:10

tables [2] 117:3, 8  
 tag [1] 94:16  
 Tagamet [2] 172:8, 20  
 takes [1] 49:24  
 talk [17] 3:23; 29:22; 37:13, 15; 43:21; 111:3;  
 113:19; 116:11, 17; 120:17; 126:17; 128:20;  
 137:25; 138:2; 162:2; 166:14  
 talked [18] 7:13; 14:18; 16:6; 30:21; 34:15;  
 36:4; 47:1, 15; 55:16; 65:24; 104:10; 111:4;  
 128:19; 130:13; 152:22; 166:15; 170:7; 175:5  
 talking [51] 4:25; 5:1; 6:17; 8:9; 10:12; 15:20;  
 18:8; 19:14, 18; 25:3, 7, 21; 26:13, 15; 27:14,  
 15; 30:9; 46:22; 57:11; 70:14, 25; 71:6; 73:23;  
 74:9, 18; 75:20; 76:23; 85:7; 86:14, 23; 92:6;  
 106:21; 107:22; 113:12, 14; 116:7; 117:24;  
 118:15;  
 121:15; 123:3; 124:3; 131:18; 135:6; 142:7;  
 152:25; 155:18; 156:24; 161:18; 166:6; 177:18  
 tank [1] 71:21  
 tanks [1] 15:2  
 tape [2] 14:19; 16:15  
 taste [1] 56:3  
 tasted [2] 55:25; 59:16  
 tasting [2] 55:23; 59:9  
 taught [3] 12:19; 13:4  
 Taxable [1] 183:17  
 teach [1] 55:14  
 technician [1] 176:8  
 Technology [2] 32:9; 33:10  
 technology [2] 137:10; 138:19  
 tecum [3] 4:2; 29:19; 187:9  
 telling [6] 56:6; 59:22; 60:2; 80:14; 120:19;  
 145:22  
 tells [5] 28:23; 91:25; 123:10  
 temporarily [1] 168:10  
 ten [3] 53:20; 61:14; 132:24  
 tend [5] 41:25; 42:11; 64:7; 134:20, 21;  
 135:20  
 tendency [1] 41:14  
 tends [4] 42:4; 57:14; 65:6; 134:24  
 term [19] 66:23; 107:2, 9, 11, 13, 18, 23;  
 108:1, 5, 9, 14, 17; 136:4, 7; 139:3, 6, 10;  
 140:5; 153:22  
 termed [1] 154:24  
 terms [7] 55:15, 19; 65:13; 131:17; 133:20;  
 137:19; 173:14  
 test [8] 63:3; 65:9; 82:19; 160:3, 25; 161:11,  
 14  
 tested [2] 63:3; 64:3  
 testified [1] 3:2  
 testify [4] 7:6, 12; 8:13, 15  
 testifying [2] 175:25; 176:20  
 testimony [6] 127:5; 130:3; 132:8, 21; 181:6;  
 184:10  
 testing [2] 64:1; 160:25  
 tests [18] 64:13; 106:11; 159:19, 20, 21;  
 160:1, 13, 16, 17, 18; 161:1, 7, 9, 11, 17;  
 162:5  
 tet [3] 150:23; 164:13, 23  
 tetrachloride [8] 150:10, 11, 23; 151:1;  
 154:12; 164:25; 173:9, 16  
 TEXAS [4] 181:16; 182:1; 183:1, 5  
 Texas [15] 12:16; 143:8, 18; 181:24; 182:6,  
 20, 23; 183:15, 24; 184:6; 185:14, 16, 24;  
 186:5, 8  
 texts [3] 5:11; 85:18, 23  
 Thank [1] 100:24  
 theory [1] 94:25  
 therefor [1] 181:7  
 thereof [1] 185:1  
 they'll [3] 94:5; 105:22; 137:25

They're [3] 71:20; 100:16; 106:18  
 they're [26] 29:21, 23; 60:1; 68:25; 71:17, 20;  
 84:9; 92:7; 98:4; 103:18; 106:1, 18; 108:6;  
 113:20; 128:11; 136:13; 138:5; 141:1; 146:13;  
 147:1; 150:15; 151:14, 19; 154:16; 160:13  
 they've [3] 77:11, 13; 155:6  
 thickening [1] 101:25  
 thinking [2] 61:7; 158:7  
 third [4] 38:12; 40:6; 144:11  
 thousand [3] 142:13; 166:9  
 Three [1] 64:21  
 three [10] 8:6, 8, 17, 19; 64:19; 74:8, 17;  
 157:5, 6; 164:9  
 Threshold [1] 136:20  
 threshold [14] 55:1; 56:3, 4; 57:10; 89:6, 9,  
 16, 22; 91:14; 95:16; 147:14, 16, 17  
 thrust [1] 124:13  
 Thyroid [1] 167:11  
 tie [2] 70:2; 95:8  
 tied [1] 75:3  
 tightness [1] 102:1  
 tile [1] 90:19  
 till [2] 61:16; 86:16  
 time-weighted [2] 136:23; 138:18  
 times [10] 41:15; 66:5, 12; 108:8; 109:16;  
 120:12; 136:7; 149:1; 166:9; 177:20  
 timing [1] 41:3  
 tin [1] 72:5  
 tissue [1] 91:7  
 TLV [23] 95:15; 136:4, 19, 22; 138:15, 22;  
 139:3, 11; 140:4, 5, 10; 141:4, 8, 25; 142:5,  
 10, 12, 14, 17; 143:2, 14, 17  
 TLVs [4] 95:16; 137:19; 146:14, 25  
 to-wit [2] 185:8, 18  
 toluene [6] 134:20; 151:24; 152:7, 8; 155:10;  
 164:15  
 total [1] 176:21  
 tough [2] 68:7; 91:16  
 tour [1] 16:18  
 towards [1] 41:14  
 Toxic [2] 37:4; 83:15  
 toxic [19] 37:2; 41:16; 55:9; 67:10, 21; 68:8,  
 14, 22; 85:3, 4; 105:15; 111:1; 133:21; 135:22;  
 145:12; 148:21, 22; 154:24; 166:11  
 toxicity [5] 69:3, 6; 83:17; 92:22; 150:12  
 toxicologist [1] 38:2  
 toxicologists [6] 25:6, 8; 26:1, 9, 14; 27:21  
 toxicology [11] 11:23; 12:1, 8, 13, 24; 13:2, 9,  
 10; 38:2; 68:11; 107:17  
 trace [3] 165:4, 7, 11  
 traces [1] 164:4  
 tract [1] 100:4  
 transcript [9] 181:5; 182:10; 184:9, 12, 14, 20,  
 23; 185:1, 8  
 transformed [1] 158:21  
 treating [1] 176:8  
 treatise [4] 35:25; 80:5, 25; 143:19  
 treatises [6] 80:15, 18; 82:5; 84:18; 155:5;  
 156:16  
 treatment [1] 99:18  
 trial [10] 7:7, 12, 21, 22; 8:13, 16; 50:25;  
 127:5; 180:18; 185:6  
 trichloroethylene [2] 165:10; 173:10  
 TRIEFF [2] 3:1; 183:11  
 Trief [18] 3:9; 26:20; 29:17; 31:7; 76:19;  
 77:22; 94:19; 156:13; 172:22, 23; 180:2;  
 181:3, 13, 19; 187:6, 11, 15, 24  
 Trinalin [1] 171:17  
 trips [1] 12:17  
 true [6] 11:23; 44:4; 108:22; 181:5; 182:10;  
 184:9

truthful [3] 60:10, 14, 21  
 truthfulness [1] 59:24  
 tunnel [1] 90:17  
 turns [1] 62:16  
 Tussi [1] 172:8  
 Tylenol [3] 102:6, 11; 172:9  
 type [19] 6:5; 9:6; 25:5, 6; 26:8; 31:19; 32:6;  
 33:18; 49:21; 59:1; 67:3; 72:13; 75:24; 76:11;  
 89:17; 99:7; 100:8; 155:17  
 typed [1] 73:8  
 types [7] 25:24; 65:10; 81:22; 88:9, 14; 89:22;  
 124:1  
 typically [4] 25:8; 27:19; 58:3; 65:8  
 typographical [1] 180:7

## - U -

Uh-huh [3] 43:10; 105:10; 170:17  
 unable [2] 108:24; 126:25  
 unaffected [1] 89:10  
 undergo [3] 149:10; 150:5, 7  
 undergoing [1] 149:13  
 undergraduate [2] 11:25; 12:4  
 undersigned [1] 181:19  
 understand [31] 7:19; 8:21; 12:11; 18:3; 19:6;  
 20:21; 24:24; 25:21; 26:4; 50:13; 51:22; 54:2;  
 58:13; 80:4; 81:9; 93:11; 96:11, 22; 106:4;  
 111:13; 120:21; 121:15; 127:4; 140:4; 142:25;  
 153:15; 159:14; 173:6, 23; 177:13; 178:9  
 understanding [6] 9:4; 28:17; 56:5; 87:13;  
 136:22; 165:3  
 understood [1] 169:13  
 University [2] 12:15, 16  
 university [1] 13:12  
 unlikely [1] 128:16  
 upper [1] 101:9  
 urine [4] 158:15, 22; 159:1  
 UTMS [2] 13:13; 176:24

## - V -

V-i-c-o-d-i-n [1] 102:16  
 value [4] 89:7, 9; 136:20; 147:17  
 values [1] 95:16  
 vapor [1] 140:21  
 variables [2] 65:25; 66:19  
 varied [1] 133:1  
 variety [2] 117:11; 126:20  
 vary [2] 57:15; 180:14  
 varying [1] 113:21  
 venting [3] 6:18, 20; 15:3  
 versa [1] 174:17  
 version [1] 10:25  
 versus [2] 64:3; 177:2  
 vertigo [1] 154:14  
 vestibular [1] 155:11  
 vi [1] 184:22  
 vice [1] 174:17  
 vicinity [7] 56:17; 82:10; 86:6; 88:3; 113:2;  
 123:6; 132:10  
 Vicodin [4] 102:14, 16, 19; 172:9  
 video [2] 77:25  
 videotape [10] 14:19; 15:8, 9, 10; 16:7; 21:22;  
 22:10; 77:23; 78:2, 7  
 view [3] 16:7; 38:19; 139:13  
 viewing [1] 16:6  
 vii [1] 184:25  
 viii [1] 185:16  
 visibility [1] 23:9  
 visited [1] 16:13  
 vitae [3] 3:11; 29:17; 187:6  
 volatile [2] 15:3; 55:7

Volume [1] 116:23  
 volume [2] 141:1, 2  
 vomiting [4] 125:13; 175:8, 10, 15

## - W -

walk [2] 72:25; 73:5  
 walking [1] 54:18  
 wanted [6] 18:3; 20:2; 53:23; 62:22; 69:23;  
 158:1  
 waste [6] 28:11, 18, 20, 24; 29:1; 166:12  
 watch [1] 61:6  
 water [8] 28:12, 18, 21, 24; 29:1, 3; 82:24;  
 96:8  
 watery [1] 125:7  
 ways [1] 114:21  
 we'd [1] 7:11  
 We'll [1] 76:15  
 we'll [15] 3:14, 25; 6:23; 27:8; 33:6, 11, 16;  
 35:14; 94:16, 17; 116:17; 158:11; 180:8  
 We're [2] 86:23; 118:15  
 we're [28] 5:6; 6:14; 8:9; 10:8; 36:15, 24; 37:7;  
 40:16; 57:11; 61:7; 69:3; 72:24; 73:23; 74:9,  
 15; 76:23; 81:9; 86:14; 92:6; 93:10; 107:22;  
 113:19; 156:15; 161:18; 179:9; 180:4  
 We've [5] 75:3; 86:18; 129:20; 130:20; 171:7  
 we've [12] 16:6; 33:8; 35:9; 58:11; 95:13;  
 98:17; 127:8; 128:19; 149:11; 153:4; 165:11;  
 179:21  
 wear [1] 78:13  
 wearing [1] 78:15  
 weak [4] 97:15, 16; 136:24  
 welding [1] 112:19  
 weren't [2] 129:20; 173:20  
 Whenever [1] 86:7  
 whenever [2] 61:11; 114:18  
 whereas [1] 108:7  
 wherever [1] 156:1  
 wind [1] 180:11  
 withdrawal [1] 167:3  
 WITNESS [7] 18:22; 27:1; 77:24; 86:21;  
 100:17; 177:22; 181:1  
 Witness [3] 4:23; 182:16; 186:1  
 witness [7] 7:18; 184:7, 10, 15, 16, 19, 22  
 woman [1] 171:8  
 won't [1] 58:5  
 wondered [1] 146:17  
 wondering [1] 143:8  
 words [30] 11:10; 24:7, 9; 36:22; 41:2, 4;  
 42:12; 45:2, 17; 48:17; 55:1, 3; 57:10; 59:8,  
 24; 62:14; 64:2; 86:9; 88:19; 105:4; 115:17,  
 25; 118:24; 133:3; 138:21; 158:22; 159:19;  
 171:25; 175:7; 176:7  
 work [13] 12:18; 15:17; 57:9; 67:25; 68:4;  
 105:7; 136:24; 176:15, 19, 20, 21, 23; 177:1  
 workday [1] 136:24  
 worked [2] 177:13, 16  
 worker [5] 138:20, 22; 139:19, 21; 144:10  
 workers [2] 136:25; 137:8  
 working [8] 8:16, 19; 92:7; 105:11; 142:6;  
 144:4, 14; 156:22  
 worse [1] 41:7  
 wouldn't [13] 27:25; 41:6, 7, 9, 10; 54:4; 89:9;  
 104:20; 105:7; 143:1, 4; 159:10  
 wrap [1] 178:2  
 wrapper [1] 185:4  
 write [1] 31:24  
 written [2] 138:11; 141:18  
 wrong [1] 136:21  
 wrote [3] 22:15; 90:4; 141:13

- X -

x-ray [2] 105:21, 22  
x-rays [1] 106:11  
xylene [1] 134:20

- Y -

y'all [1] 26:17  
Yeah [122] 3:13, 21; 8:10; 11:1; 13:15; 14:8;  
17:14; 18:18; 19:5; 20:4; 23:20; 25:14; 27:6;  
25; 39:5, 23; 41:11; 42:18; 43:3; 45:22; 46:8;  
47:16; 49:22; 51:1; 56:13; 58:14; 61:13; 62:24;  
64:22; 66:17; 69:2; 70:25; 71:25; 73:3, 7, 11,  
25; 75:18;  
77:15, 25; 78:4, 8; 81:9, 21; 82:1, 16; 83:7;  
84:6, 17, 22; 86:21; 87:1; 90:3, 5, 7; 91:23;  
92:21; 94:11, 13; 99:1, 10; 100:10, 17, 24;  
103:6, 8; 105:6; 106:6; 107:22; 109:11;  
111:23; 112:1; 117:1, 21; 119:12; 120:20;  
121:24; 122:2, 11; 127:11; 128:2, 23;  
129:2; 130:7; 131:9, 10; 136:17; 141:6, 17;  
142:24; 145:5, 16, 19, 23; 146:16; 147:13, 20;  
150:20; 152:14; 155:6; 158:5; 159:3, 11;  
160:3; 161:8, 24; 162:3, 8; 164:21; 165:18;  
167:14; 168:15, 23; 169:1; 171:23; 172:15;  
175:22; 176:22; 177:22; 178:9, 19  
yeah [16] 27:1; 39:23; 40:14; 51:10; 77:24, 25;  
78:5; 86:18; 99:11; 110:3; 131:15; 136:14;  
150:25; 157:5; 176:13  
year [2] 13:20; 156:2  
years [16] 13:18; 48:25; 86:10; 87:7, 12;  
90:23; 97:2; 109:6; 114:16; 118:25; 120:5;  
176:1, 14; 177:3, 7  
you'd [2] 68:13; 155:23  
you'll [1] 11:18  
You've [3] 16:10, 23; 155:15  
you've [46] 3:18; 4:2; 9:4, 9; 12:22; 13:23, 25;  
33:8, 18; 35:20; 36:3; 43:11; 49:14; 50:7; 51:7;  
23; 55:3, 6, 8; 56:18; 64:2; 73:1, 4; 74:8;  
77:12; 88:8; 92:16; 116:18; 117:8; 136:4, 6;  
139:10; 145:7, 8; 152:4, 22; 155:16; 162:6;  
164:22;  
165:1; 171:14; 175:23; 176:14; 179:12, 24  
young [1] 144:6  
yourself [1] 11:2

- Z -

zéro [2] 79:6; 93:5  
zinc [2] 112:10, 19